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The Experimenting Station at Lievin, France

Main Purpose of the Organization Is to Solve Problem of Coal Dust Explosions. The Equipment for Research Work Is Most Elaborate

BY TONY CALLOT*

The experimenting station of Liévin, France, was established in 1907 by the Comité Central des Houillères de France after the Courrières disaster, to study all the questions dealing with the safety in mining which necessitate experimental researches. Its main aim is to solve the problem of the inflammation of coal dust.

Before the fearful explosion of Courrières on March 10, 1906, no serious dust inflammations had occurred in any French colliery. All the efforts of the mining engineers had been confined to the study of preventing the accumulation of firedamp and its possible inflammation. Extensive experiments had led to the elimination of many of the so-called safety lamps and to the adoption of the Marsaulé lamp since 1890. Further experiments had provided for the specification of the types of explosives that would not cause the inflammation of firedamp, should this gas be present at the coal face or in underground workings.

The thorough application of the mining by-laws, which were the result of these experiments prevented any serious mine accident during a period of 14 years. The average number of workmen killed by firedamp explosion between 1892 to 1905 was 0.26 per 10,000 in France, 1.06 in Belgium, 1.49 in Prussia and 1.2 in England. French engineers were proud of the results achieved. Then came the Courrières disaster in a mine where no firedamp had ever been detected. As a matter of fact some inflammations of coal dust had been noticed, but never had they been of a serious character and no authority could have affirmed at that time that a dust inflammation was able to spread itself indefinitely. Now the Courrières accident has shown it was so, and the Monongah disaster, in West Virginia, has confirmed this fact.

It is a new danger, ignored in France before 1906, and the precautions taken against firedamp seem to make greater the possibility of a dust disaster. In fighting firedamp, ventilation was increased, causing dust to float in the air and to be spread all along the galleries, while the dust produced by the sorting and screening plants situated close to the pits, entered the mines with the aspirated air, thus producing a continuous deposit of coal dust throughout the workings and facilitating the extension of a local inflammation.

Solving the Problem

Several solutions of this problem were presented. The only one that was tried, consisted of spraying water in the galleries. It is an expensive process, which does not prove altogether efficient, for the principal cause of the Reden explosion in Germany was attributed to coal-dust inflammation, while the water-spraying process was used in that mine. Further, the production of a wet atmosphere in the mine increases the development of the ankylostomiasis and the presence of circulating water may cause breakdowns in a ground of moderate solidity. English and Belgian engineers who were early advocates of the dust danger have not yet decided to use water spraying as an accepted remedy.

Experience alone can answer the question. Some experiments were carried on in French laboratories by Mallard and Le Chatelier on the influence of the character of the coal, the fineness of the dust, the volume of the flame used for the inflammation, the percentage of inflammable gas mixed with dust, etc. Later on, Mr. Simon studied the inflammability of dusts by explosive shooting and determined some interesting data. But none of the French or other engineers had at their disposal a sufficient plant to study the possibility and the laws of the remote propagation of dust inflammation, as well as the possible causes of such an inflammation.

It was known that such a plant would be expensive, but, in face of its import-

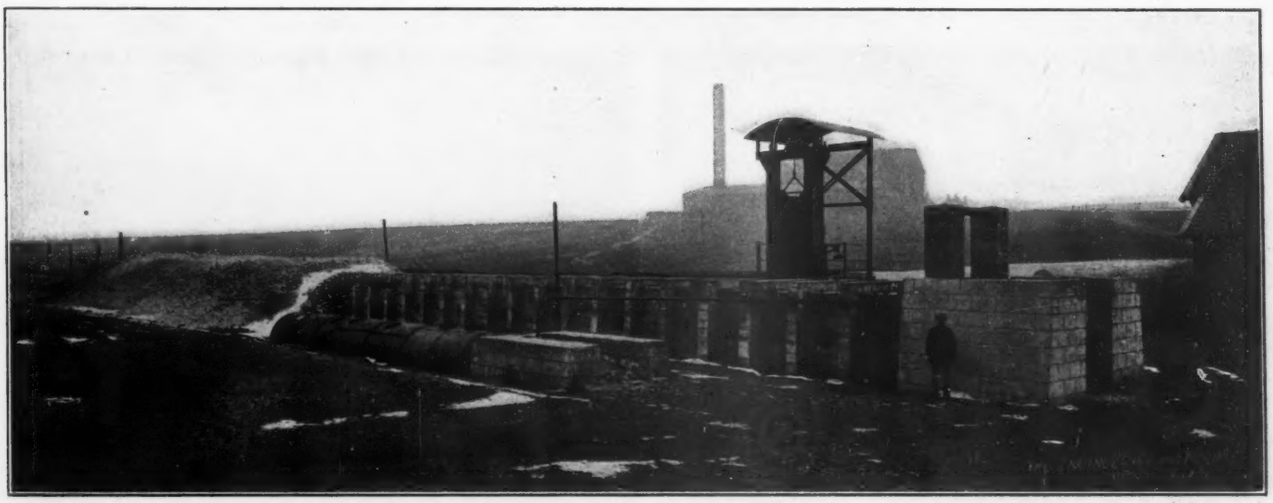

FIG. I. GENERAL VIEW OF THE EXPERIMENTAL GALLERIES AT LIEVIN. AUXILIARY GALLERY IS SHOWN IN FOREGROUND AT LEFT

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NOTE—Extracts from a pamphlet by Mr. Taffanel, manager of the station, and issued by the Comité Central des Houillères de France.

ance, the Comité Central des Houillères de France decided to erect it, at a cost of some $70,000 and to spend $15,000 yearly to carry on experiments. The research work proposed was along the following lines:

1. To study the inflammability of coal dusts, the conditions under which the propagation of the inflammation occurs and the means of fighting against the danger of dusts.

2. To study and control the safety of the explosives used in mines in the presence of firedamp or dusts, as well as the safety of the processes and appliances for shooting same.

3. To study and control the safety of the mining lamps and electric contrivances used underground.

4. To study the life-saving apparatus.

5. To establish a laboratory for scientific and practical researches relative to safety in mines.

6. To inquire abroad, especially after great mining accidents, and note particulars useful for the solving of the above problems.

Description of the Station

The experimenting station, as installed, includes the following appliances and buildings:

One main experimenting gallery and an auxiliary one; a house with offices, laboratory and sundry machinery; a coal-crushing plant; a coal store; two firedamp gasometers; a lodging for the guardian. The station is located at Liévin, in the Department of Pas de Calais, close to Lens and not far from Courriéres.

Main Gallery

Up to now, the gallery has been only 65m. long (213 ft.), but will be lengthened in 1909 up to 500m. (about 1600 ft.) and will include, according to the necessities, one or more branches.

The first section of 65m. consists of two parts; at the start a length of 30m. was built of reinforced concrete, the end being made with various materials, the resistance of which was tested in view of the future extension.

The whole gallery has a trapezoidal section and is fitted with usual timbering. There are no relief valves so that the pressure of the explosion may have its full effect as in underground galleries. The walls of cement of the first length of gallery are 18 to 22 cm. thick and are strengthened every 5 ft., at which intervals, the thickness is increased to 57 cm. The iron frames include 6 iron bars 30 mm. diam. and 3 bars 16 mm. diam. surrounding the gallery at each support, and many others in the walls between two consecutive supports. This part of the gallery is calculated for an internal pressure of 60 lb. per sq.in. with the usual coefficients of safety. The size of the gallery inside is 1.85 m. high by 1.4 m. wide at top and 1.6 m. at bottom. Ten observation windows 8x6 in. fitted with 1 3/16-in. reinforced glass have been provided at the middle hight of the wall facing the observation room located in the main building. They are placed close together, and are located at the head of the gallery to allow a thorough examination of the phenomena which take place at the start of an explosion.

As the observation of phenomena at the end of the gallery would not be easy from

FIG. 2. A VIEW OF THE STATION SHOWING THE GALLERY UNDER COVER AND ALSO THE CEMENT GALLERY

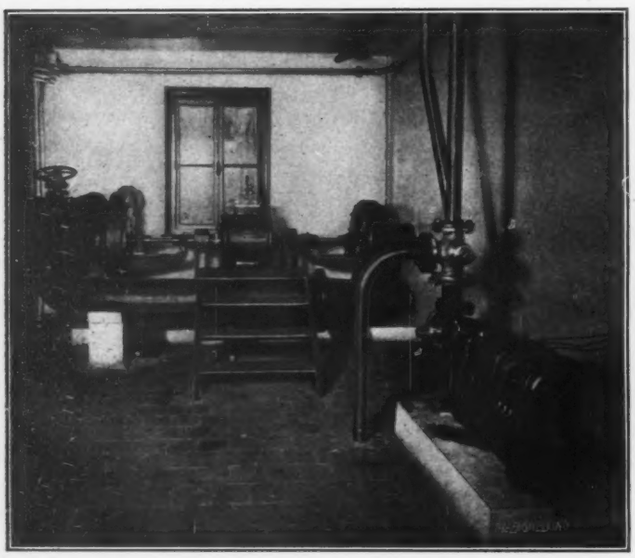


FIG. 3. MACHINE ROOM AT THE LIEVIN STATION

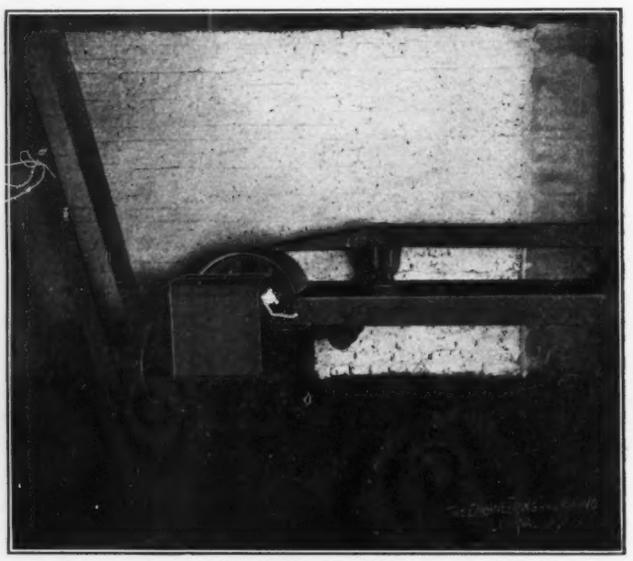


FIG. 4. SHOWING DUST INJECTOR

the main building, registering appliances are under erection to notice the progress of the flames. This will be rendered still more necessary when the extension of the gallery is completed.

Experiments were made on the best type of timbering for the second part of the gallery. It was found that wood frames as used underground were soon dislocated even when strengthened by iron squares. Only strong I-beams placed close together could bear the effects of the explosions under 5 ft. of waste.

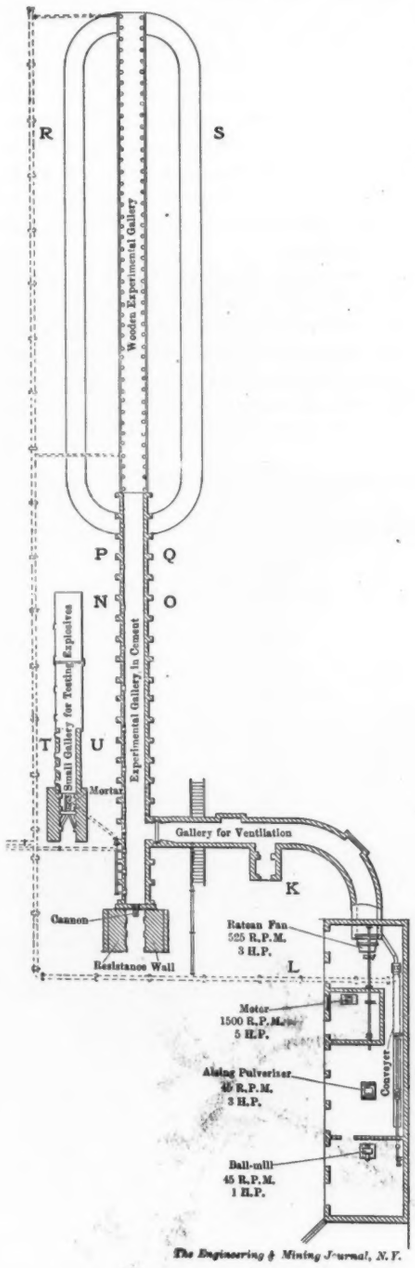


FIG. 5. SHOWING GENERAL PLAN OF THE VARIOUS GALLERIES

The gallery may be opened at one end or at both ends at will. One of the ends, instead of being made of concrete or masonry, as in similar plants, is formed by a number of big lumps of timber strongly tied together by wedges and tie rods.

Ventilation

Ventilation is effected by a Rateau helicoidal fan having a capacity of 8 to 9 cu. m. of air per second under a pressure of 15 mm. of water (5/8 in.) The ventilator is connected to the main gallery by a special passage which may be used as an entry to the main gallery for inspection. The fan serves to send fresh air after a test and to create a draft when it is desired to experiment on dust explosions in a current of air. To prevent breakage of the fan by an explosion, a strong valve has been provided, which was calculated to resist a force of 60 lb. per sq.in. with the usual coefficients of safety.

Coal Crushing Plant

Coal is crushed in a special room to produce the dust required for the experiments. At the rate of 450 grams (1 lb.) of dust per cu.m., about 600 kg. of coal will be necessary per test in the future 500 m. gallery.

Coal taken from the store is first broken by hand hammers and then fed to a ball-mill fitted with a 1.5 mm. screen, at the rate of 80 kg. per hour. The final crushing is done in an Alsing pulverizer, consisting of a cylinder fitted with a number of small 8x15 mm. steel bars and revolving at 45 r.p.m. The machine is fed from time to time with a charge of about 30 kg. of coarse-crushed coal and allowed to revolve for some time, when one of the solid ends is replaced by a screen which prevents the escape of cylinders. The screen analysis made after 15 min. running gives an oversize of 35 per cent. on a 200 mesh screen and of 1.5 per cent. only after a run of one hour.

Dust is distributed in the gallery by hand when it is desired to obtain the ordinary underground conditions. For other tests such as the study of phenomena of the propagation of the inflammation in a dust cloud made in advance, dust is fed regularly onto a belt conveyer at the rate required and thus delivered to a blast pipe which works as an injector. This pipe connects with the fan gallery close to the fan's outlet so that dust is spread in the air and brought into the test gallery. The valve is quickly closed down and an explosion may take place without damaging any machinery. A small 5-h.p. electric motor drives the crushing plants.

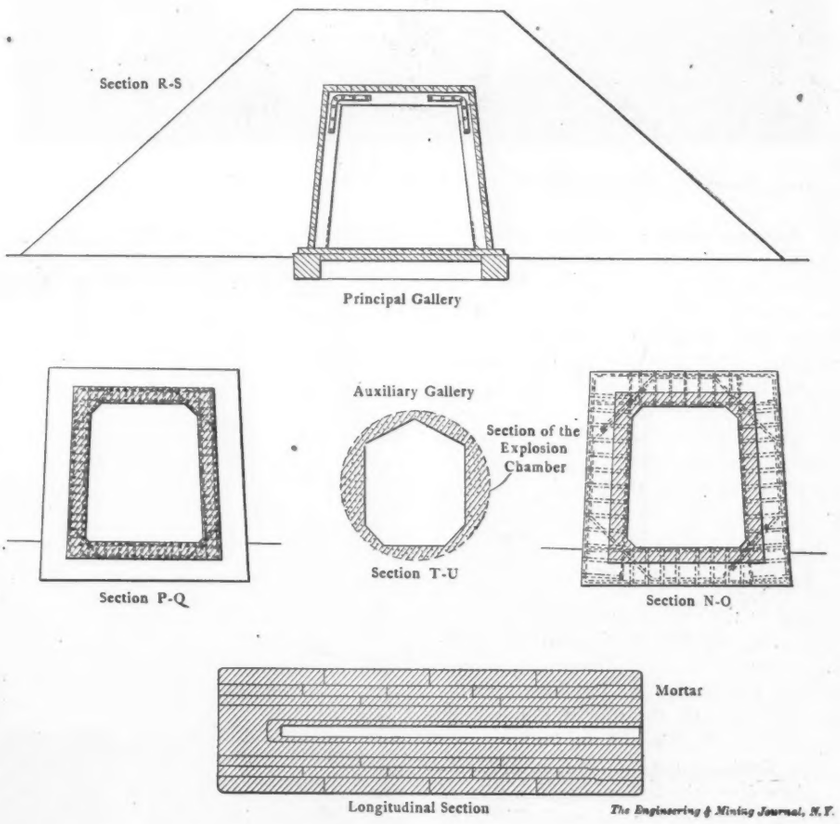


FIG. 6. SECTIONAL VIEWS OF THE EXPERIMENTAL GALLERIES AT LIEVIN

Cleaning the Gallery

After each experiment the gallery must be cleaned out. This is usually done by sweeping, while the fan is running, and the dust is thus transported to the out-

side. When a more thorough cleaning is necessary, the men connect air hoses to an air main which is laid along the gallery, and they blow off, from every corner, the dust that might have deposited itself. The draft of the fan helps the dust out.

Shooting

Shooting is done by explosives placed in shooting mortars with or without a firedamp explosion. The experimenting station at Liévin is equipped with two mortars, one with a hole 55 mm. diameter by 600 mm. long, able to bear an internal pressure of 48 tons per sq.in.; the other mortar has a hole 40mm. diameter by 1200 mm. long, and is capable of resisting a pressure of 95 tons per sq.in.; this mortar weighs 1100 kg. The mortars may be placed anywhere in the gallery, or at the end of it amidst the timber beams which close it, being thus located to resemble a drill hole ready to shoot. In the case of firedamp explosions a special room is created in the main gallery by means of a diaphragm consisting of gas-tight packing paper on a wood frame. A proper mixture of air and gas is blown into the chamber through the top of the gallery, an outlet is provided in the bottom.

The firedamp used in the experiments is taken from the underground works of the No. 3 shaft of the Mines de Liévin at a depth of 526 m. through a pipe 1600 m. long. The average volume received per 24 hours is 75 cu.m. of gas assaying 85 to 93 per cent. of CH_4 with a small percentage of oxygen and CO_2. The gas is stored in a 300-cu.m. gasometer and in a smaller one of 25 cu.m. capacity. This latter is fitted at the top with a water tank, which can be filled more or less, in order to give the gas any desired pressure. Firedamp is delivered at the rate required through a perforated pipe. The gas is delivered in due proportion to produce the mixture aimed at. The volume of the mixture is measured.

Observations—Registering Appliances

Detonations are always caused by an explosive with electric shooting, the magneto being placed in the observation room. Horizontal glass slits placed at eye level are the only windows of this room facing the gallery. They allow a good examination through the windows of the gallery.

To measure the maximum pressure which takes place during an explosion, the compression of a small copper cylinder or "crusher" between a piston and a thrust is measured with an accuracy of 1/100 mm. For small pressures the copper cylinder is replaced by a lead sheet into which a steel ball penetrates. Standard tables give the corresponding pressures. A registering chronograph of Professor Weiss' system is under erection; this instrument will be used to measure the speed of the inflammation. It consists of a drum revolving at a uniform speed which registers the vibrations of a diaphragm, and a set of electric signals which will correspond to the time when the flame passes at known points of the gallery.

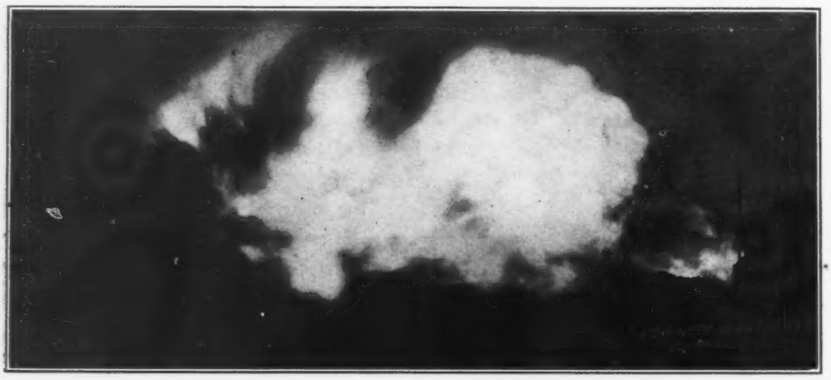


FIG. 7. SHOWING DUST EXPLOSION. THE FLAME EXTENDS FROM MOUTH OF MAIN GALLERY

Auxiliary Gallery

The erection of a second gallery was made necessary by the many experiments the station has to carry on, and the long time lost in cleaning the main gallery and spreading the fresh dust. In the present 65-m. gallery, three experiments can hardly be completed each day. When the 500-m. gallery is finished, the delays between two consecutive experiments will be still longer.

This auxiliary gallery is used mainly to study the safety of explosives in the presence of firedamp and dust. It is half underground and consists of the cylindrical bodies of three old boilers about 2 m. diameter, and has a total length of 15 m. The first boiler is still fitted with one of its ends which forms the end of the gallery. It leans against two strong, solid walls to prevent the drawing-back effects, and is fitted inside with reinforced cement to protect it against the explosions and to bring its cross-section to an area of 2 sq.m.; this provides the same conditions

FIG. 8. INTERIOR VIEW OF THE GALLERY OF REINFORCED CEMENT

as exist at the experimenting stations of Frameries and Gelsenkirchen.

Lamp Tests

Lamps are tested in a pipe where the firedamp mixture is blown in, so that conditions will be similar to those obtaining in deep mines where the atmospheric pressure increases. It consists of a rectangular metallic pipe 12x6 in. which can revolve around a horizontal shaft. A mixing apparatus is fitted on the shaft and includes three valves. The intermediate valve is drilled with oblique holes which cause air and gas to converge. A blind valve moves upon the previous one and regulates the delivery. The back valve drilled with holes corresponding to the air holes of the intermediate valve regulates the percentage of air in the mixture. An outlet valve in the tube provides for the maintenance of a pressure higher than the atmospheric pressure. This apparatus is placed outside the observation room before a special window, while the valves are operated from the inside.

Sundries

A duplex-Rateau-turbo compressor supplies the whole plant with the necessary compressed air. It is actuated by a 20-kw. motor at a speed of 3000 r.p.m. When working in series the two turbines are able to give a pressure of 5 ft. of water. The capacity of the set is over 750 liters per second with 30-in. water pressure. An electric pump for the small gasometer and the gas and air mixer referred to above complete the machinery of the main building. A transformer and switchboard form the electric equipment to bring the 5000 volts tri-phase current down to 110 volts. A well equipped laboratory has been installed in the main building.

I would not close my article without thanking the Comité Central des Houillères de France and Mr. Taffanel for their courtesy in allowing me to make this extract of the pamphlet they issued about the Station d'Essai de Liévin, for the Engineering and Mining Journal.

Using Mine Water as Motive Power

By D. T. Pierce*

There are many mines with wet shafts, in which a considerable amount of water has to be collected and pumped out, but there are probably few cases in which the water falling down the shaft has been utilized for driving machinery underground. Under these circumstances the experience of the Bowhill Coal Company may prove interesting to those who have a similar set of conditions to contend with.

The circumstances leading up to the introduction of water as a source of power in the mine in question were these:

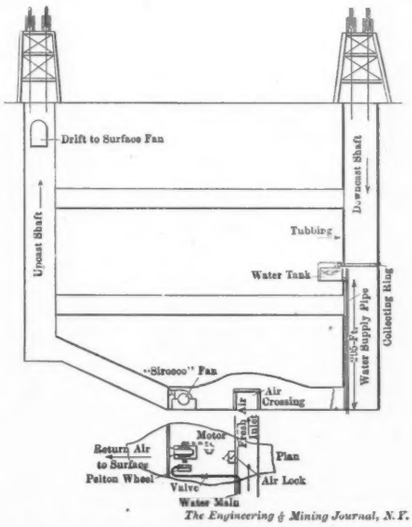
*Tribune building, New York.

Some time ago R. A. Muir, the general manager of the Bowhill Coal Company, found that the surface fan was not capable of providing sufficient ventilation on the lowest of the three working levels, and on measuring the resistance at each level he discovered that the highest resistance existed in the bottom seam. He therefore concluded that if this could be reduced it would ease the drag on the surface fan.

Aiding Ventilation by an Auxiliary Fan

To meet the demands of the case, he decided to install an auxiliary fan to deal with the entire ventilation of the bottom seam, and to allow for development, a 60-in. diameter double inlet "Sirocco" fan was installed, capable of dealing with from 60,000 to 90,000 cu.ft. of air per minute at from 1 to 3 in. water gage.

To collect the water falling down the



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SHOWING GENERAL ARRANGEMENT FOR USING WATER AS MOTIVE POWER

downcast shaft, the tubbing was cut, and a ring fitted round the shaft, which conveyed the water to a tank placed in a lodgment especially made for the purpose. A pipe was then taken from the tank to the bottom of the shaft, giving a head of 295 ft. which was utilized to drive a Pelton wheel of 4 ft. 6 in. diameter, various sizes of nozzles being supplied to give the speeds required for the different duties.

As electric power is also available in the mine, provision was made for driving the fan by belt from an electric motor, in the event of the water supply failing for a time, but although the plant has been running for some little time, it has not yet been found necessary to use the electric motor, as the water supply has been quite sufficient.

Should it be necessary to stop the fan at any time, a by-pass valve is arranged, which allows the water to be discharged into the sump, from which the main pumps draw their supply.

The accompanying sketch shows clearly the general arrangement of this unique plant.

Coalfields of Colombia

According to a recent report of the United States Consul-General at Bogota, the coalfields of the Republic of Colombia are well situated to take advantage of the markets which will be made available by the openng of the Panama canal. There are at present three routes by which the coal can be sent to the canal: 1. From the Rio Hacha and Santa Marta fields to Colon, across the Caribbean sea, 500 miles. 2. Darien to Colon, 200 miles. 3. Buenaventura, on the Pacific to Panama, 400 miles. When the mouth of the Magdalena is opened for steamers and the navigation of the river improved, coal may be exported by this additional route. No geological survey has ever been made of the Colombian coalfields, but the known measures are given as follows: 1. Bogota coalfield. 2. Tequendama, south of Bogota. 3. Zipacon, west of Bogota. 4. West side of the Magdalena. 5. Subachoque, near where the Pradero Iron Works are established. 6. Cajica. 7. Government mines at Yapaquira, where there are large beds of rock-salt. 8. Nemocan mines, private and government. 9. Sequile and Guatavita. 10. Sueboa. 11. Pacho Iron Works and coal deposits. 12. Outcrops at Ubate, Fuquene, and Valez. 13. Tunja, Sogamoso, Santa Rosa de Viterbo and Gambita. 14. Department of Santander. 15. Cucuta district. 16. Magdalena district. 17. Santa Marta district. 18. Llanos. 19. Popayan. 20. Cali, to be operated by the Pacific railway. 21. Between Cali and Cartago, and in the Cauca Valley. 22. Choco and Darien. The means of communication in Colombia are inadequate. There are twelve short railways, none of them over 70 miles in length, but several traverse coalfields. The navigable rivers are only suitable for vessels of light draft. The lower Magdalena is navigable for about 600 miles, and the upper river, at times, for about 100 miles.

The output of fluorspar in the United States during 1908, according to statistics collected for The Mineral Industry, was 39,389 short tons, valued at $212,647, which is to be compared with a production of 36,350 short tons, valued at $202,736, in 1907.

Only 17,969 flasks (75 lb.) of quicksilver, valued at $805,690, were produced in the United States in 1908. As usual California furnished the greater part of the total output. In 1907 the production was 20,932 flasks valued at $868,678. These are the figures of The Mineral Industry.

Coal Mining Methods at Gary, West Virginia

Mines of United States Steel Corporation Claim Distinction of Being Safest Operations in the World. No Explosion Fatalities in 18 Years

BY JOHN S. WALKER*

The United States Steel Corporation, in its search for a high-grade coking coal, to meet the constantly increasing demands of its numerous plants, some years ago leased 50,000 acres in McDowell county, at the southern extremity of West Virginia. These holdings are on the line of the Norfolk & Western railway, about 10 miles from Welch, and are in the Pocahontas field, along the Tug river and Pinnacle creek.

In 1902, prospecting and development were begun under the name of the United States Coal & Coke Company. The property was thoroughly tested with diamond core drills, to prove the thickness and continuity of the seam, and to determine the best locations and methods for openings. The town of Gary was established as headquarters and shipping point, and under the direction of Edward O'Toole, general superintendent, and H. N Eavenson, chief engineer, a thriving community has been installed in this mountain wilderness.

There are now 12 mines in operation, all fully equipped with the most modern and efficient machinery. During April of this year the production averaged about 9000 tons per day. If this coal were all mined from one spot or working face, it would cover one acre in area per day.

At 8 mines, the company has erected large blocks of beehive coke ovens, numbering 2151 in all. About half the coal is made into coke at Gary, the remainder being shipped raw and coked at its destination. Most of the product is sent to the Illinois Steel Company's works at Joliet and South Chicago, Ill., while a portion goes also to Sharon, Pennsylvania.

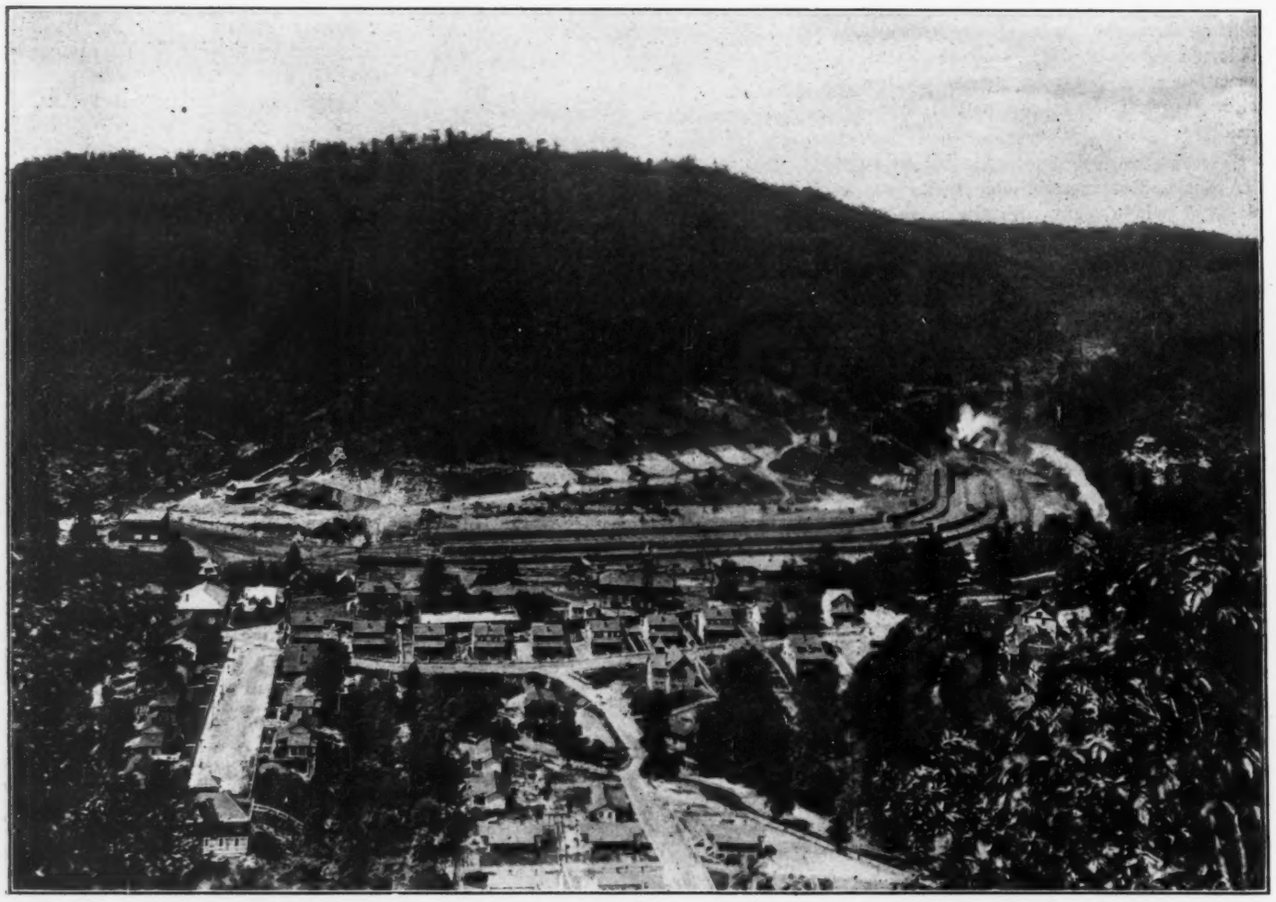


FIG. 1. TOWN OF GARY, WEST VIRGINIA, SHOWING NO. 3 MINE AND COKE OVENS OF THE UNITED STATES COAL AND COKE COMPANY

System of Mining

The company mines the No. 3 and No. 4 Pocahontas seams, which range from 4½ to 8 ft. in thickness. The coal is medium hard, and nearly level, and is overlaid by slate, providing fairly strong roof. The mines are all worked from the outcrop, on the drift principle, except mine No. 1, which is reached by a shaft 180 ft. deep. The method of operation is practically the same in all the mines, with slight variations to suit local conditions, and is shown by the accompanying sketch of a part of No. 1 mine. The rooms are turned on 60-ft. centers, giving a 40-ft. pillar and a 20-ft. room. The entries, room-necks and breakthroughs are 12 ft. wide. Props are set in the rooms from 8 to 10 ft. from the face.

The entries are usually driven in a series of four, but sometimes five parallel headings are driven to secure proper ventilation. All permanent overcasts and stoppings are built substantially of concrete, and heavy barrier pillars are left to eliminate danger. About one-third of the coal is at present mined by machines, or

*Huntington, W. Va.

70,400 tons out of the 210,400 produced in April, 1909; this percentage is being steadily increased by the installation of additional mining machines. The management first installed machines in the fall of 1906, to enlarge the production during a period of labor scarcity. Mining machines of various patterns were tested, and the Sullivan class "C E" continuous-cutting electric chain type was finally adopted as standard, owing to its high cutting capacity and ease of operation.

These coal cutters, of which the company has now over 30, make a cut 6 ft. 7 in. deep, and 5½ in. high. They are designed to mine from left to right or from right to left, depending on the location, in the room, of the track. The armatures are wound for the uniform underground current of 250 volts. The accompanying photographs taken in No. 3 mine, show these machines, and several stages in their operation. It will be noted that after the rib cut is made, the rear half of the frame is uncoupled, and the jacks set in opposite corners of the room. The machine then travels across the face like a longwall cutter, under its own power, making a continuous mining. This type occupies less than 6 ft. at right angles to the face of the coal, so that it is unnecessary to take down and replace props to permit its passage. The small space occupied by the machine also makes lighter work for the loaders.

These machines are used for driving entries, room necks and breakthroughs as well as for rooms. They are moved from place to place on self-propelling trucks, and perform all operations of loading, unloading, etc., under their own power. The cutting is all done at night and the loading during the day shift. This arrangement prevents interference of coal loaders with machines as they go from place to place, and at the same time gives both the machines and the electric haulage locomotives plenty of current at all times.

The average work during April for 27 machines was 7½ places, or about 120 tons per machine per 10-hour shift, although some individual records made were much in excess of this average. The coal not mined by the machines is undercut by hand pick. The standard mine car used is of wood or steel, holding 93 cu.ft., and running on 40- and 60-lb. steel rails on main haulage roads with a 48-in. gage. As stated above, haulage is by electric locomotives of several types.

FIG. 2. COKE OVENS AT THE NO. 1 MINE OF THE UNITED STATES COAL AND COKE COMPANY

FIG. 3. GENERAL OFFICE OF THE UNITED STATES COAL AND COKE COMPANY

FIG. 4. SHOWS THE "SUMPING" OR "RIB" CUT. IN THIS CASE THE CUT IS AROUT TO BE MADE IN THE LEFT-HAND CORNER OF THE ROOM, PRIOR TO CUTTING FROM LEFT TO RIGHT

Surface Plant

Figs. 7 and 8 show the tipples at the No. 6 and No. 7 mines, which structures are typical of those in general use. The later tipples are built of steel, with modern devices for handling the coal as it comes from the mines. Coal for the ovens goes through crushers and then into large storage bins, from which the coke larries are charged.

At each tipple there are also steel chutes for loading into the railroad cars. The ovens are equipped with large doors and wide yards to permit the use of coke drawing machines. Twelve of these are used, pulling about 65 per cent. of the coke from the company's ovens.

Power Equipment

The central power plant from which all the 12 mines are operated is at Gary, adjoining mine No. 3. The boiler house contains nine horizontal water-tube boilers, giving a total horsepower of 3800. The furnaces are charged automatically by underfeed stokers, supplied from overhead steel bins.

Generators

In the engine room are two 400-kw. generators, and two 750-kw. generators, direct-connected to cross-compound Harrisburg engines, and two 750-kw. generators, direct-connected to Corliss cross-compound engines; also one 1000-kw. low-pressure and one 1000-kw. high-pressure turbo-generators, the former taking its steam supply from the reciprocating engine exhausts.

These units generate three-phase, 25-cycle alternating current at 6600 volts, which is transmitted to substations at each mine, and there altered to 275-volt direct-current for the mining machines, pumps and locomotives, by rotatory converters and transformers.

The machine and forge shops are well equipped with modern tools for electrical and machine repairs, insuring the rapid and economical work essential for a large industry such as this, far from a source of supply.

The company's offices, general store, power station and shops are large, permanent stone buildings, with ample provision for growth. About 3000 men are employed at the various mines, including a construction force of 300. The employees include Americans, foreigners of several nationalities and negroes, who live

FIG. 5. SHOWS THE MACHINE PART-WAY ACROSS THE FACE, CUTTING FROM LEFT TO RIGHT

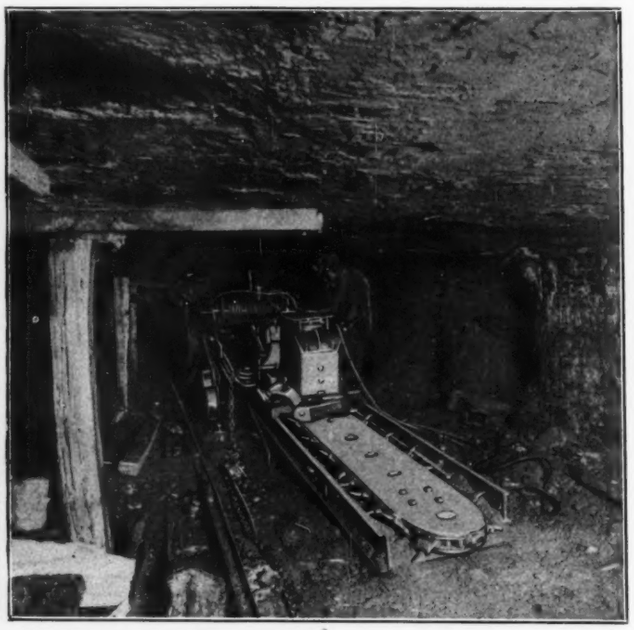
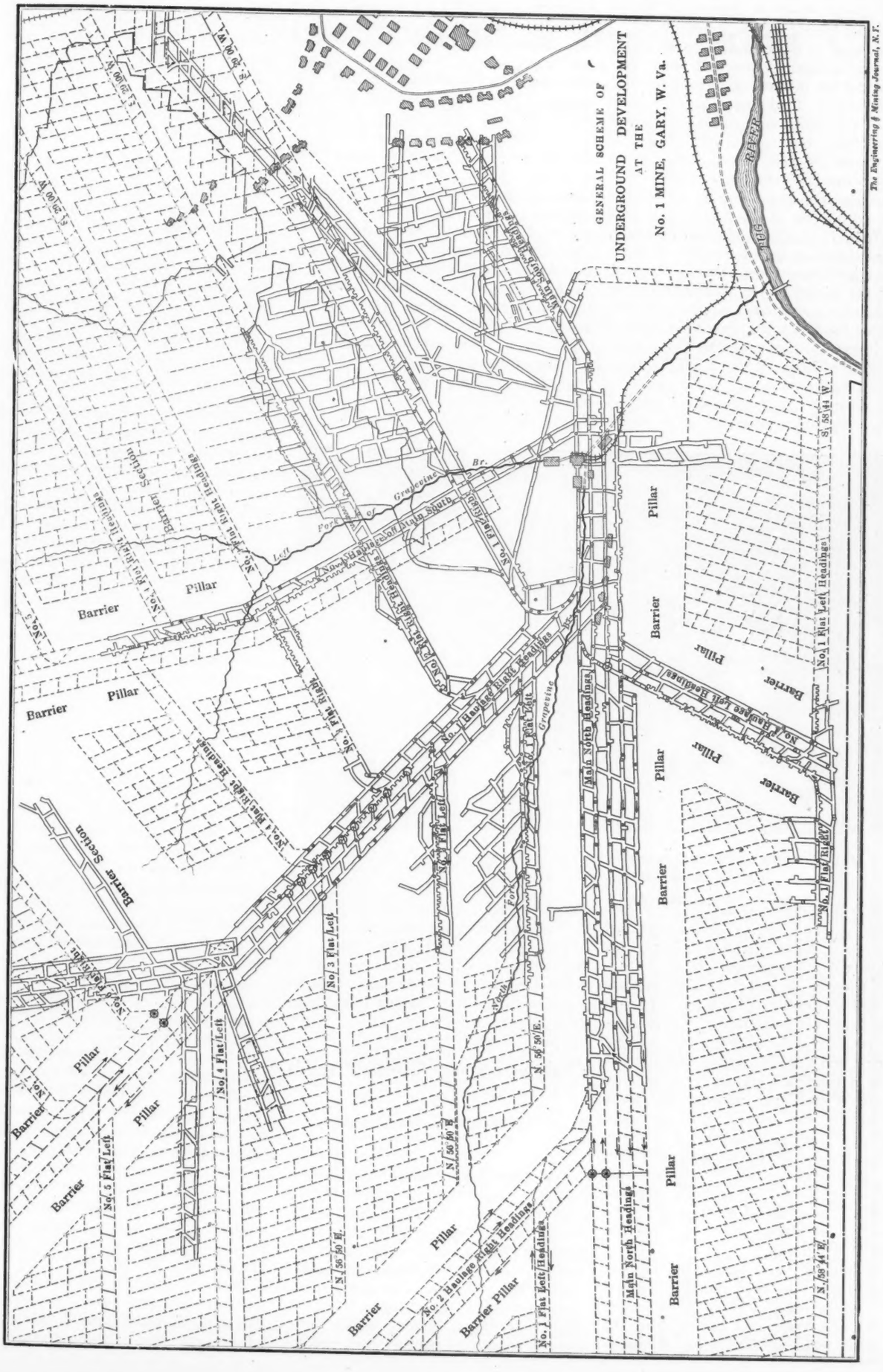


FIG. 6. THE MACHINE IS UNLOADED FROM THE POWER TRUCK, OR IS PUT ON IT, BY ITS OWN POWER

FIG. 7. NO. 6 TIPPLE AND CHUTE OF THE UNITED STATES COAL AND COKE COMPANY

FIG. 8. NO. 7 TIPPLE OF THE UNITED STATES AND COKE COMPANY


GENERAL SCHEME OF
UNDERGROUND DEVELOPMENT
AT THE
No. 1 MINE, GARY, W. Va.
The Engineering & Mining Journal, N.Y.
RIVER
Barrier Section
No. 1 Haulage Right Headings
No. 2 Haulage Right Headings
No. 3 Haulage Right Headings
No. 4 Haulage Right Headings
No. 1 Haulage Left Headings
No. 2 Haulage Left Headings
No. 3 Haulage Left Headings
No. 4 Haulage Left Headings
No. 1 Flat Left
No. 2 Flat Left
No. 3 Flat Left
No. 4 Flat Left
No. 5 Flat Left
No. 1 Flat Right
No. 2 Flat Right
No. 3 Flat Right
No. 4 Flat Right
No. 5 Flat Right
Main North Headings
Grapevine
Barrier
Pillar
Barrier Pillar
N. 56° 50' E.
N. 58° 44' W.
N. 58° 41' E.

to a large extent in substantial houses built and owned by the company.

The town of Gary is well paved, lighted, and has excellent water and sewer systems and fire protection.

The U. S. Coal and Coke Company enjoys the distinction of being considered by the State mine authorities one of the best equipped and safest properties in West Virginia. It is interesting to know that under the administration of Thomas Lynch, president of this company as well as of the Frick Coal and Coke Company, a remarkable record of freedom from accident has been made. During the year 1907 the mining under his administration produced over 80,000,000 tons of coal, ranking them as first among the coal-mining industries of the world. In 18 years these mines have not lost a life by a gas or dust explosion.

At Gary all the properties are supplied with a carefully drawn set of rules regarding the ventilating and sanitary conditions of the mines. These are printed in seven or eight languages in large type, and posted in conspicuous places. Particular attention is called to the necessity for careful handling of powder. It is required that not more than a certain number of men shall work in any one air current, and that the current shall not fall below a stipulated velocity or a quantity of 10,000 cu.ft. per min. at any point throughout the entire mine workings. The mine foreman, assistant mine foreman and minor officials are paid premiums each month during which no one under their jusrisdiction is seriously injured. Since the adoption of this method accidents of all classes have been reduced more than one-half.

Premiums are also paid to the superintendents who keep their plants in the best and neatest order, also to householders for the best kept yards and gardens. In the main office at Gary a set of rescue apparatus is installed for use at the various mines in case of emergency. The records show that in spite of the fact that the country being developed is entirely new, and the subordinate officials are often strange to their positions, the number of accidents occurring, in proportion to the miners employed, is the lowest, not only in the State, but in any other State or in any foreign country. As was noted above, all the coal in these mines is undercut before being shot. No shooting from the solid is permitted and men are employed to see that the coal is properly mined before shooting, thus eliminating the great danger to life from shooting off the solid, to say nothing of the amount of smoke done away with.

The haulage roads are built with plenty of room on the right side for cars to pass, and the roads are kept perfectly clean and free of débris on both sides. One of the parallel entries is a traveling road, free of trolley wires and other equipment so that employees are not required to go to and from their work in the haulageway. Nevertheless, refuge stations are opened every few feet on the haulage road, together with openings, leading into the independent manway.

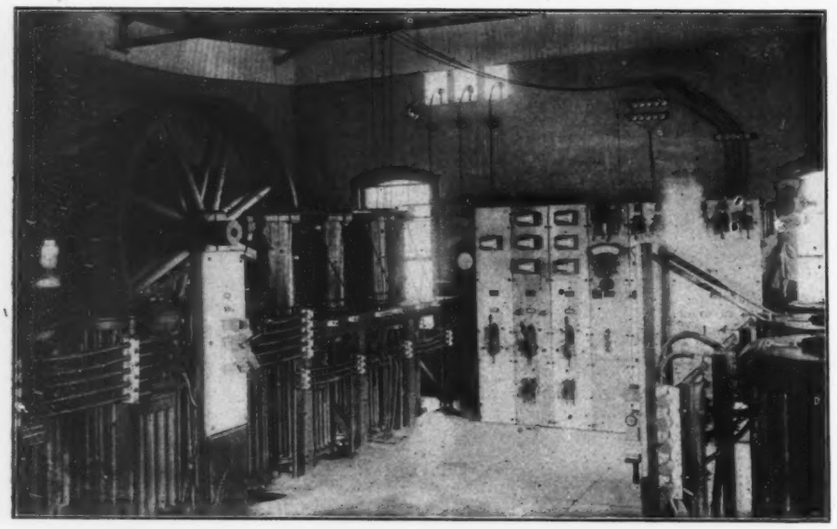


FIG. 9. POWER HOUSE TRANSFORMERS AND SWITCHBOARD AT THE GARY PLANT OF THE UNITED STATES COAL AND COKE COMPANY

Coal Mining in Alberta, Canada

SPECIAL CORRESPONDENCE

The following are official statistics relating to coal mining in the province, in 1908, with those for 1907 in parentheses: Number of mines in operation, 112; new mines opened, 19 (35); old mines reopened, 2 (2); mines abandoned, 6 (6): coal mined, 1,845,000 (1,834,745) tons; coke produced, 75,657 (73,782) tons; coal briquets produced, 36,261 (49,585) tons; average number of persons employed inside the mines, 2681 (2700), outside, 1099 (900); number of fatal accidents, 11 (19), nonfatal, 51 (85). Of the coal produced, 584,334 (639,335) tons was lignite; 1,011,571 (939,295) tons was bituminous; and 249,095 (256,115) tons was anthracite. Coal used in making coke was 128,397 (112,887) tons.

THE PROVINCIAL INSPECTOR'S REPORT

The provincial inspector of mines reported: "The year 1908 has shown a steady development in the mining industry of the province. Trade conditions, which have been unfavorable all over the country, have had a considerable effect on the coal business. There is only a slight increase in coal production as compared with 1907, but the increase would have been much greater, judging from the development at the mines, had trade conditions been better.

"Coal is being mined in the south of the province, practically from the eastern to the western boundary. In the West we have extensive mines producing bituminous coal of both coking and steam varieties, while as we leave the mountains and come on the prairie, toward the East, we find high-grade lignite coals. On the main line of the Canadian Pacific railway west of Calgary we have the Canmore mines, producing a high grade of steam coal, and the Bankhead mines, producing a good grade of anthracite coal. In the Edmonton district there are numerous mines, which supply the local demand and also ship a considerable quantity of coal to the towns along the Canadian Northern and Canadian Pacific railways.

THE USE OF SAFETY LAMPS IS REQUIRED

"The policy adopted by the department requiring the use of locked safety lamps in mines where there is any danger of explosion from gas or dust has been enforced throughout the province, and the inspectors are finding less and less opposition to the introduction of safety lamps, as the operators in most cases are not slow to realize that the use of safety lamps tends to lessen the danger from explosions. . . . The past year shows a considerable decrease in the number of accidents."

It is noteworthy that production of coal has increased from 811,228 tons in 1905 to 1,845,000 tons in 1908. The detailed report of the inspector shows a considerable improvement in mining machinery and appliances. The official expectation is that "the increased railway mileage now in sight in the province coupled with the steady increase in population, will necessitate in the future a steady increase of tonnage produced, and this with the passing away of the recent financial depression gives a reasonable ground for the prediction that the coal output during 1909 will be much greater than it was during 1908."

Genesis and Development of the Coking Oven

Although Recently Much Skill Has Been Exercised in Perfecting Details the Main Features of the Modern Oven Were Used before 1860

BY W. GALLOWAY*

The preparation of coke from pit-coal appears to have been practiced for at least 250 years. It was probably first begun owing to the increasing difficulty of procuring supplies of timber for making charcoal for metallurgical, malting, and other purposes in which the more easily obtainable, and therefore cheaper, coke was substituted for the more expensive charcoal. To commence with, and for many years afterwards, in fact far into the last century, coke was for the most part made in exactly the same way as charcoal.

Large coal was stacked in circular or oblong piles in the open, partially or wholly covered over with a wet layer of fine coke-dust (Fig. 1), and with certain channels (*c*, Figs. 2 and 3) for the passage of air formed in them just above the level of the ground, and extending from their periphery to one or more vertical chimneys (*a*, Figs. 1, 2, and 3) or holes (*b*, Fig 3) in their center. The circular piles were from 15 to 20 ft. in diameter and 3 to 3½ ft. high; the oblong piles 12 to 18 ft. wide, 3 to 3½ ft. high, and 30 to 50 ft. long. The ends of the air-channels next to the periphery were sometimes formed with inverted cast-iron troughs with holes in them (Fig. 2 B); their ends next to the chimneys (*b*, Fig. 2) with the largest blocks of coal, and their intermediate parts (*c*, Fig 2 A) with "dry" bricks.

The chimneys had cast-iron lids with handles (Fig. 1) for closing them airtight when required. Ignition was effected at the bottom of the chimneys, or vertical holes, by dropping burning coal and pieces of wood down through them; and the fire gradually spread from the center towards the periphery, or in the opposite direction to the air-currents. Care was taken to keep the mantle of damp coke-dust as airtight as possible while this was going on, and when smoke ceased to issue from the chimneys or holes all openings were sealed up and the heaps allowed to cool. The whole operation lasted about a week or eight days; and, so far as one can gather, the yield of coke appears to have amounted to from 45 to 55 per cent. of the quantity of coal employed.

The First Ovens for Coking Coal.

Ovens for coking coal are first mentioned in the latter half of the eighteenth century. In 1773 Horne and in 1782 the Earl of Dundonald obtained patents for the recovery of the by-products obtainable from coal coked in closed vessels or chambers. The Dundonald patent provided for the admission of a restricted and regulated supply of air to the interior of the chamber for the purpose of creating sufficient heat to carry on the process of distillation by the partial combustion of the gases. From that time forward, ovens

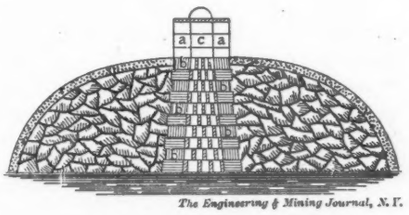


FIG. 1. EARLY METHOD OF STACKING THE COAL IN A CIRCULAR PILE

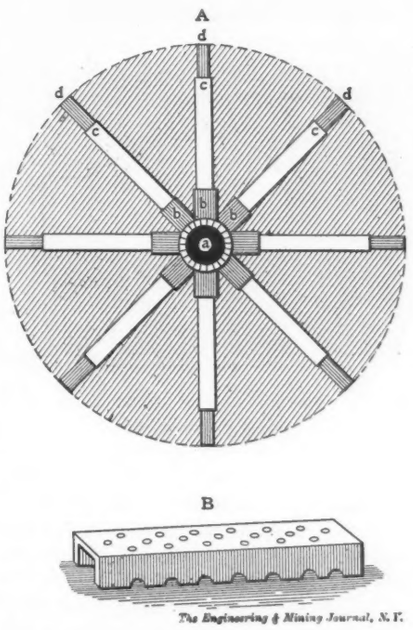


FIG. 2. SHOWING PLAN OF COAL PILE, AND INVERTED TROUGH

worked upon the Dundonald principle (but, except in rare cases, without arrangements for the recovery of the by-products) have been in constant use. The more ancient ovens were circular, elliptical, or ovoid in plan, with a dome or cupola for a roof, and were known as bakers' ovens; the more recent, square or trapezoidal, with a cylindrical arch for a roof.

One of the former, depicted by Scheerer, is shown in Fig. 4. It was provided with an air-passage, which entered the masonry on each side of the doorway *o' o'*, passed all round about the chamber as shown, and was connected with its interior by branches *o*; a circular outlet *b* for the products of combustion, which was probably also used for introducing part of the charge; and a cast-iron door *t*. Its vertical walls were from 2½ to 3½ ft. high, in some cases more; and its diameter or other dimensions varied from those required to accommodate a charge of 1½ tons up to those required for several tons.

Each oven was provided with a doorway at one side or one end, with an outlet for the gases in the top, and with one or more inlets for air. The charge was introduced through the doorway, or partly through the doorway, partly through a hole in the roof, and both of these openings were afterwards more or less completely closed.

The escaping gases passed into a short chimney and thence into the atmosphere. Circular ovens of this class, known as Beehive, have persisted up to the present day. The coke was drawn out through the doorway by means of a long iron rod bent into the form of a ring at one end to serve as a handle, and at right angles to itself at the other to serve as a hook.

The time required for coking varied from 48 to 72 hours, according to the magnitude of the charge; and the yield of coke varied from 50 to 65 per cent., according to the quality of coal and other circumstances. Many of these ovens produced a very fine, much-prized, quality of coke. After a charge had been drawn out, the walls, as a rule, retained sufficient heat to ignite the following charge, which was introduced as soon as possible.

The work of drawing the hot coke out through a narrow doorway, in an oven of any shape whose diameter, or width, is greater than that of the doorway, is, as can be imagined, a most laborious and exhausting operation. This consideration led to the construction of rectangular ovens of greater length than width, with a doorway of the full width of the oven at one end, and later, as will be seen further on, with a doorway at each end. When ovens of this shape with a doorway at one end—some of which are still in use—are about to be charged, an iron frame—frequently made of two pieces of old permanent-way rail, one as long, the other nearly as wide, as the oven, one end of the longer bar fixed at right angles to the

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NOTE—A paper read before the South Wales Institute of Engineers, Jan. 20, 1909.
*Mining engineer, Cardiff, Wales.

middle of the shorter bar, and its other end provided with a strong link—is pushed in along the floor until the cross-bar touches the back wall.

METHODS OF DRAWING THE CHARGE.

The charge is then introduced and coked in the ordinary way. When the coke is ready to be drawn out, the door is removed, the charge is cooled with water inside the oven, a hook, at the end of a chain which extends from a windlass at the opposite side of the coke-bank, is passed through the link at the outer end of the longer bar, and the charge is drawn out on to the coke-bank in one block. With longer rectangular or trapezoidal ovens, which have a door at each end, the charge is pushed out by means of a ram with a shield at one end, and cooled with water, partly as it emerges from the oven, partly after it has fallen in pieces on the coke-bank.

These appliances for drawing and pushing out the coke were introduced between the years 1850 and 1860. They are referred to by Hartmann, who wrote on the subject of coking in 1858, but not by Scheerer, who wrote in 1846. They are both still in use; but trapezoidal ovens with a door at each end are rapidly superseding those with only one door; and consequently the ram is coming into practically universal use, except, of course, in the case of beehive ovens.

Up to the year 1840 no attempt appears to have been made to apply heat generated by the combustion of the gases to the outside of the oven walls with the object of coking the charge in its interior. At that date Cox obtained a patent for an oblong rectangular oven, with two cylindrical arches over the coking chamber, one above the other, with an empty space between them. The lower arch extended from the back to near the front, where it terminated, leaving a communicating passage between the space below it and the space above it, and air was admitted through holes in the back walls into the space between it and the top of the charge.

The products of combustion thus passed from back to front under the lower arch, then up into the space between the two arches, then back over the lower arch into the flue, and so up the chimney. This appears to have been the first attempt made to increase the heat of the chamber by circulating the hot gases on the outer side of one of its walls.

It would be difficult to trace the exact course of events during the next 20 years, but the following extract, translated from the writings of a contemporary writer, will serve the purpose of throwing some light upon it.

Writing in 1858, Hartmann[1] says: "Improvements in the processes of coking have, during recent years, been the object of many experiments and investigations, in Belgium and Rheinland, which are not yet terminated. . . . . The object of these improvements has been to produce better coke, to reduce the time required in coking it, and to obtain a greater yield, so as to be able to compete with English coke, which is made of the best materials and is of exceptionally good quality,.

"In the whole of these investigations one principle, whose practical application has been sought for in many different ways, has been steadily kept in view—namely, to employ the waste heat in order to effect the distillation of the charge. . . . . It stands to reason that this object can be effected only by means of more or less complicated apparatus.

"In all these improvements the main problem has been to prevent the consumption of coal through contact with air outside the oven, and to subject every part of the oven to a uniform temperature. . . . This object was sought to be attained in Belgium by the construction of ovens of very small dimensions, and by associating a number of ovens together in one system, in which the waste heat of one oven could be employed in heating the coal newly charged into another oven. . . . . This was effected by conducting the gases through flues below and in the side walls of the ovens, and extracting as much heat from them as possible before allowing them to escape into the air.

"It must be remarked in this place that the actual *combustion* of the gases was not contemplated, except in the case of a few ovens. At first, apparently, the contact of the hot gases with the walls of the ovens was all that was thought of, although it is obviously in the combustion of these gases that their greatest heating power lies; and in the case of most ovens, even now, without this being the intention of their constructors, combustion takes place by the leakage of air through the open joints of the brickwork at the ends of the horizontal flues . . . The Talbot and Dulait ovens constitute an exception to this rule, as provision is made in both for the complete combustion of the gases.

"The construction of the flues in detail can naturally be carried out in many different ways: for instance, ovens have been placed one above the other, one alongside the other, or end to end, or two or three ovens, or a whole row, have been built in a range, and so on.

"This principle was obviously carried too far in Belgium, as is best illustrated by the greater simplicity recently introduced in the suppression of many of the flues whose useful effect upon the ovens did not appear to compensate for their great cost.

"Nevertheless, heating the floor and side-walls of the ovens by means of the waste heat must continue to be the guiding principle in all cases."

After expressing himself thus, Hartmann proceeds to compare the results of coking coal in the newer with that of coking it in the older ovens, and draws the conclusion that the newer ovens are really cheaper in first cost than the older ones, since they occupy less space and yield a greater quantity of coke than is necessary to compensate for their higher first cost.

During the years of experiment and investigation spoken of by Hartmann, the

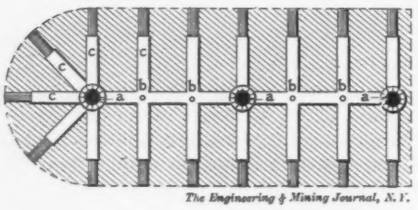

FIG. 2. GENERAL ARRANGEMENT OF OBLONG PILE, WITH AIR-CHANNELS

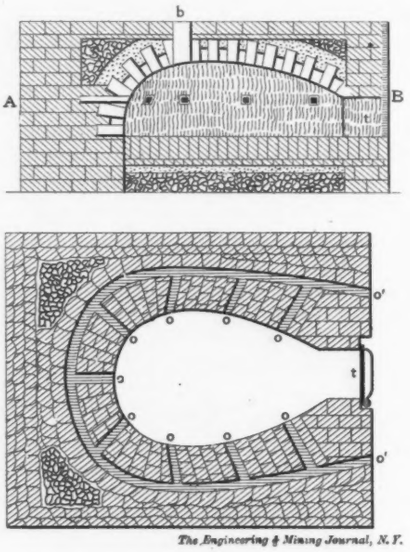

FIG. 4. GENERAL DESIGN OF ANCIENT OVEN WITH CUPOLA ROOF

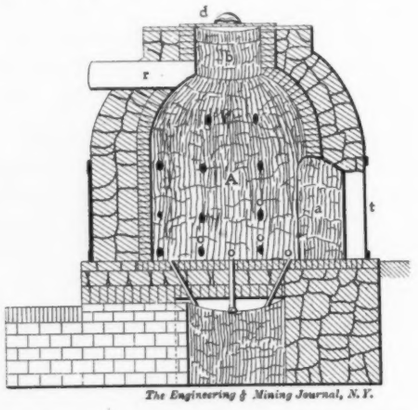

FIG. 5. EARLY TYPE OF GERMAN OVEN WHICH RECOVERED THE VOLATILE PRODUCTS

[1]Hartmann, *Die Aufbereitung und Verkokung der Steinkohlen* (1858), p. 137.

retort-oven proper was thus evolved and brought into active use, and all the improvements that have been added to it since then have been simply modifications in its structure and dimensions.

An Early Type of Oven which Enabled the Recovery of the Volatile Products.

Writing in 1846,[1] Scheerer described certain coking ovens in use at that time at some of the ironworks in Germany (Gleiwitz in particular), from which the volatile products were led away in pipes to condensers for the purpose of recovering a certain quantity of tar from them, which could be usefully employed on the spot (Fig. 5).

Each oven stood alone, was cylindrical to about two-thirds of its hight, and was covered in by a hemispherical dome. It had a doorway *a* on one side, extending from the floor to about one-half of its internal hight; a second circular opening *b* in the dome, of a little less than one-half its diameter; an outlet-pipe *f*, say 9 in. in diameter, extending horizontally through its walls from the apex of the dome, on the side opposite to the door, to the condenser; five rows of holes *o o*, equally spaced radially round about its periphery, all the holes of each row being in the same horizontal plane, the lowest row close to the floor, the highest row near the apex of the dome, and the intermediate rows spaced equally between the highest and the lowest; and lastly some similar holes in its floor, communicating with a space excavated for this purpose below the latter, into which air could be drawn from the outside. Each of the holes *o o* in the sides and floor was formed by building a cast-iron pipe of 1½ in. internal diameter in the masonry.

The oven was charged, partly through the doorway, partly through the opening in the dome, with 35 to 40 cwt. of large coal. The largest pieces were placed next the floor and built together in such a manner as to enclose a hollow space into which fire could be introduced from the doorway. The charge extended up to the lower side of the outlet-pipe, and thus almost completely filled the oven. After the charge had been introduced, the doorway was then built up with masonry *t* to the level of the kindling hole, all the radial holes except those of the lowest row were closed with well-fitting plugs, and a cast-iron door *d* was placed on the hole in the dome and made air-tight. Soon after lighting the charge the upper part of the doorway was built up and luted with clay.

When the coal opposite the lowest row of holes showed an orange-colored glow, that row was plugged and the next higher one opened, and so on with the others. About 36 or 40 hours after ignition the time had arrived to plug the highest row. Then the oven was allowed to cool for 12 hours, the door was pulled down, and the coke drawn out and extinguished with water. The yield of coke is said to have been 53 per cent., but the quantity of tar obtained is not mentioned. This oven appears to have been a modification of Lord Dundonald's, and it would therefore be interesting to know whether it was in reality a survival from the closing years of the eighteenth century, when the patent for its use was granted.

In 1862 Pernolet[1] obtained a patent for an oven which he described as intended to "utilize the products of distillation of coal so as to reduce the price of coke," and in 1864 he read a paper on the subject before the Institution of Civil Engineers. It was a beehive oven into which no air was admitted; the heat was applied only underneath its floor; the volatile products were conducted in pipes to condensers and scrubbers, in which the tarry matters and ammonia were separated from the permanent gases; the latter could then either be used for lighting purposes or returned to the ovens and burnt in the flues beneath them—or partly one, partly the other. The quantity of gas thus obtained was obviously thought, or found by experience, to be insufficient to generate all the heat required, for each oven was provided, in addition, with a furnace and fire-bars underneath its floor, on which coke-breeze, waste coke, and, if necessary, small coal could be burned so as to supply the deficiency. Pernolet claimed that his ovens gave the following results:

Coke	69.3 per cent.
Tar	3.0 per cent.
Sulphate of ammonia (10 lb. per ton of coal)	0.44 per cent.

Mr. A. L. Stevenson[2] who employed thirty-six Pernolet ovens in the north of England for a number of years, and experimented with various modifications of ovens of the Pernolet type, says he found that the beehive shape, 11 ft. in diameter, gave the best results, namely:

Coke	68 per cent.
Tar	2.40 per cent.
Sulphate of ammonia (4.14 lb. per ton of coal)	0.185 per cent.

He remarks, further, that the coke was soft and the expense of repairs great, and that, as a consequence, the system was abandoned. He also states that he examined 120 Pernolet ovens employed at the Wigan Coal and Iron Company's works, and that they appeared to give somewhat better results than his own. A good many Pernolet ovens are said to have been erected on the Continent.

Not Many Improvements in Coke Manufacture Since 1860.

Enough has been said to show the genesis of the modern coking oven including its use as a retort and hence as a source of liquid by-products and gas; it would therefore serve no particular purpose, however interesting it might be from an historical point of view, to minutely describe the process of coking in circular and oblong heaps or piles. The Schaumberg kiln, Smet's, Appolt's, Talbot's, E. Jones's, and many other ovens now passed into oblivion, some of which have contributed one or more of the details of construction and methods of working embodied in modern practice. The long, narrow, high retort-oven, heated by the combustion of gas in its flues; the method of charging through holes in the top; the door constructed of fire-bricks held together in an iron frame, and raised and lowered by means of a chain; the ram for discharging the coke; the employment of the waste gases under steam boilers; and the condensation and collection of liquid by-products, were all in operation before the year 1860; and the last link in the chain—Pernolet's system of returning the noncondensable gases to the ovens, with the object of burning them in the flues beneath their floors, and thereby coking, or assisting to coke, the charge—was patented in 1862.

During the years that have elapsed since 1862 much skill and ingenuity have been exercised in perfecting the details of the modern coking oven, which is now gradually eliminating all its more ancient rivals from the field. The success of these efforts is best illustrated by the fact that in the most recent type of ovens the economy of heat is so great that after the tar and ammonia have been extracted only one-half of the permanent gas is required to coke the coal, and the other half is available for steam-raising or for use in gas-engines. The yield of these ovens per ton of coal coked is given by Mr. Hann as follows:—

Coke	80.00 per cent.
Breeze	1.75 per cent.
Tar	1.63 per cent.
Sulphate of ammonia (19.5 lb.)	0.87 per cent.

The first iron-blast furnace in South Africa was built at Sweetwaters, near Maritzburg, in Natal, some years ago, but was not successful on account of poor management. Now it is being repaired and is to be started up soon. Iron ore is found close by and limestone not far away. Coke made from Natal coal will be used as fuel.

In 1908, according to figures of The Mineral Industry, the United States produced 600 long tons of silicon worth $72,000. Statistics for earlier years are not available as the industry was in more or less an experimental stage.

The production of petroleum in Mexico in 1908 was about 4,000,000 bbl., compared to 2,000,000 bbl. in 1907.

[1] Lehrbuch der Metallurgie, Dritter Abschnitt: "Die Lehr von den Brennmaterialien" (1846), p. 325.

[1] Percy, Metallurgy—Fuel (1875).

[2] *Transactions* of the North of England Institute of Mining and Mechanical Engineers, Vol. XXIV (1873), p. 6.

The Regulation of Gas in Mine-Air Currents

An Original Investigation, by Independent Interests, the Practical Results of Which Are Destined to Aid in Eliminating Coal-mine Explosions

BY JOHN G. SMYTH*

Probably the most important factor in operating coal mines successfully is the proper ventilation of the working places. In order to make the mine safe and to retain sufficient forces to keep up a large output, all working areas must be constantly supplied with fresh air in such quantities as to carry away all smoke, foul air and noxious and dangerous gases.

The mine laws of various States are specific in limiting the number of men that may work on each air current and the laws also state the minimum quantity of air per minute allowed per man employed. The fact is that while the majority of mines have greater total quantities of air circulating than the law requires, it is often the case that the total quantity is not distributed to the best advantage and certain splits carrying large quantities of gas may have the least air.

Wm. Hopton, an Englishman, claims the credit for originating the splitting of air currents to ventilate mines. Mr. Hopton writes that he understood the system of ventilating by separate currents of air as early as 1846. Before that time, air splitting was but little practised, if known at all. In 1857 an explosion occurred at the Lund-hill colliery, England, and 139 lives were lost. This mine had separate splits, but the system in use was crude. After this explosion Mr. Hopton published the plan of ventilation adopted at that colliery and also another plan showing how it might have been ventilated by separate currents or splits, and stated that if his scheme had been in use, the great loss of life would not have occurred. This statement and the published plan aroused the mining world. His system was ridiculed, he lost his situation as mine manager and it was not for several years that the merits of his system were recognized and put in successful operation.

FIG. 1
Sampling Can for Mine Air

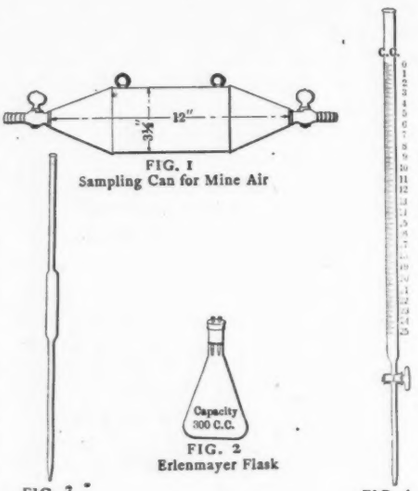

FIG. 3
Pipette

FIG. 2
Erlenmayer Flask

FIG. 4
Burette

The Engineering & Mining Journal, N.Y.

Ventilating mines by separate splits is comparatively simple while there is plenty of air available and the individual splits do not have an excessive amount of territory to ventilate. But great care and attention are necessary after the mine workings become extensive. There is often a large abandoned area to keep ventilated in addition to the live workings, and in many instances so many splits are made that the quantity of air in each approaches the minimum quantity necessary to keep the territory in a healthy and safe condition. It then becomes advantageous to determine accurately which splits require the most air, so that a few thousand feet may be taken from one and added to another if necessary. In ordinary practice the amount of air in each split and in fact the entire ventilating system, is left to the judgment of the superintendent or mine foreman who often depends on the air dividing itself naturally.

If a mine gives off explosive gas, it is necessary to know the percentage carried in each split. If it is determined that one split having 12,000 cu.ft. of air carries 0.40 per cent. of gas, while another having 22,000 cu.ft. of air carries only 0.15 per cent., an adjustment can be made and more air turned into the split with the high percentage without seriously increasing the percentage of gas in the other. In certain mines in Europe, investigations covering the percentage of gas carried in the air currents have been made for years. In some mines the air from each split is analyzed daily and if the percentage of gas runs over 0.50 per cent. the quantity

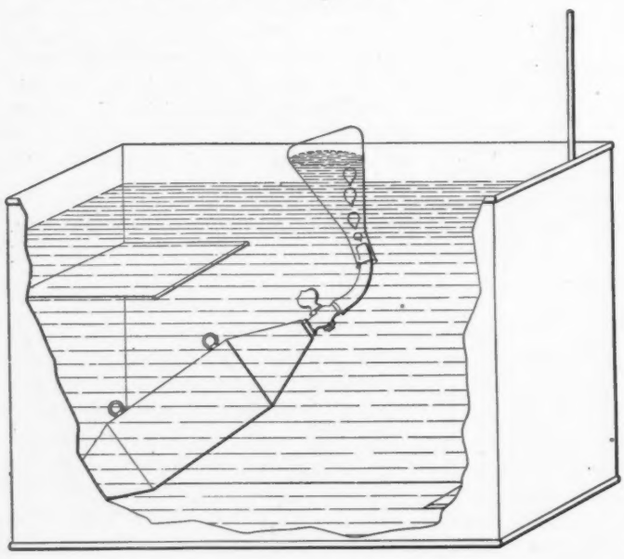

FIG. 5. METHOD OF FILLING FLASK WITH AIR

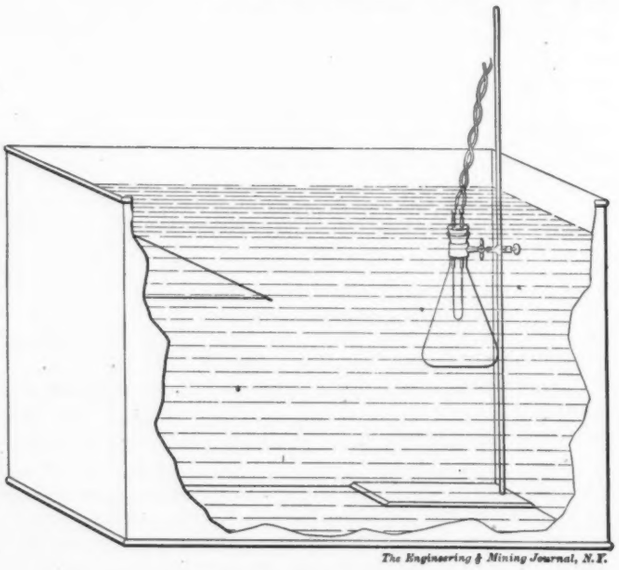

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FIG. 6. BURNING CH_4 OF MINE SAMPLE

*Chief engineer, Fairmont Coal Company, Fairmont, West Virginia.

NOTE—Paper read before the West Virginia Coal Mining Institute, Elkins, W. Va., June 1, 1909.

of air is increased or some other means taken to reduce it.

Systematic Studies of the Fairmont Coal Company

Early in 1908 the Fairmont Coal Company began to make systematic studies of the air currents in its various mines and these have since become a useful and permanent feature of the operating department.

The investigations and reports cover the total quantity of air in circulation in each mine; the quantity in each split; the relative humidity of the outside atmosphere, the main intake, main return and the intake and return of each split; and the percentage of carbonic acid gas, CO_2, and methane, CH_4, in the main air currents and in each split.

The data are collected and the analyses are made by an inspector who is thoroughly familiar with the inside workings and the method of ventilation of each mine. Certain mines are visited weekly while others are inspected at less frequent intervals. It has been found practicable to visit a mine, take all air measurements, humidity readings and samples (in some instances there may be 10 or 12 splits), return to the laboratory and make the analyses and report in a day.

The instruments used in the mine are a water gage, anemometer, hygrometer and sampling cans. The first three are too familiar to need description; the sampling cans are hollow copper cylinders 3½ in. in diameter and 12 in. long, having stop cocks at each end, Fig. 1. Small rings are soldered on the sides by means of which a number of samples can be strung together and readily carried. These cans hold about four times as much air as is required for one determination so that duplicate analyses can be made from each sample if necessary.

Method of Securing Air Sample

The samples are taken at points selected in the return air courses, usually near the end of the return current in order to ascertain the maximum percentage of gas carried in the split. The volume of air passing is always measured at the same point. The can is full of water when taken into the current, and to take the sample both cocks are opened. The water runs out of one and the air enters the other; after all the water has run out the can is carefully sealed and labeled.

In making the analyses, Hesse's titration method is used to determine the percentage of carbonic-acid gas and methane, CH_4. The air from the can is introduced into an Erlenmayer flask of 300 c.c. capacity. This is a glass flask, Fig. 2, having a rubber stopper with two holes. The flask full of water is connected with a hose to the can containing the sample. The can and flask are immersed in a bath of water, the flask inverted, and the water in the flask is displaced by the air from the sample can (see Fig. 5). By means of a pipette, Fig. 3, exactly 10 c.c. of a freshly standardized barium hydroxide solution is introduced into the flask. A few drops of phenolphthalein are added to serve as an indicator. The phenolphthalein is an organic substance which has the property of becoming red in an alkaline solution, but in an acid solution it is colorless. The flask containing the barium hydroxide is allowed to stand until all the CO_2 is absorbed. This is then titrated by the addition of oxalic acid of known strength. The end point is shown by the reddish color disappearing and the solution becoming white or almost colorless. The exact quantity of oxalic acid used is read off the burette, and the difference between this volume and the volume required for 10 c.c. of barium hydroxide used, multiplied by its standard, gives the volume of carbonic-acid gas in the sample.

To determine the percentage of methane, CH_4, another 300 c.c. Erlenmayer flask is filled with the mine air and all the CH_4 is burned to CO_2 by means of an electrode, connected to an electric battery. The combustion takes place with the flask immersed in water, Fig. 6, to avoid breaking the flask. The platinum wire must be brought to a red heat and allowed to remain red hot for 10 min. to insure complete combustion. After the CH_4 is burned, the total volume of carbonic-acid gas is determined as before. The volume of carbonic-acid gas thus determined minus the volume contained in the mine-air sample originally, represents the additional volume of carbonic-acid gas formed from the combustion of the CH_4. Since the original volume of CH_4 equals the volume of CO_2 formed by the combustion, the percentage of CO_2 formed by the combustion represents the percentage of CH_4 in the sample. The combustion of the methane takes place according to the following volumetric proportions:

$$CH_4 + 2\ O_2 = CO_2 + 2\ H_2O.$$

The results of these inspections and analyses are furnished the operating officials daily on a regular form similar to the one here shown. These reports are carefully scrutinized for indications of any irregularities in the amount of air in circulation in each split; of the atmosphere becoming dry and dusty; or of any increase in the percentage of gas. As the workings advance the percentage of gas carried naturally increases, and whenever this percentage continues to show above a certain figure, the amount of air in that split is increased or a new split is formed.

Much valuable and interesting information has been brought out by these investigations. The uniformity in the quantity of gas given off is clearly illustrated by a

FAIRMONT COAL COMPANY.

Gas Report.

Weather, clear. Temp., 60. Humidity, 29.0. Bar, 29.0. Fan W. G., 1.5. Mine..... Date, May 17, 1909.

Location.	Time.	Split.	Area.	Vel.	Cu.Ft.	Dry Bulb.	Wet Bulb.	Dew Point.	Relative Humidity.	Gal. per 1000 C. F.	Per Cent. CO_2	Per Cent. CH_4	Lab. No.
Intake	7:40	2 N.	68	1,040	70,720	63	63	63	100	0.109	....	....	.....
Return	7:50	2 N.	65	660	42,900	58	57	56	94	0.086	0.04	0.02	2,603
Intake	8:00	2 & 3	60	235	14,100	63	63	63	100	0.109	....	....	.....
Return	8:10	2 & 3	56	240	13,440	58	57	56	94	0.086	0.05	0.02	2,604
Intake	8:20	1	60	190	11,400	63	63	63	100	0.109	....	....	.....
Return	8:30	1	63	160	10,080	58	57	56	94	0.086	0.05	0.01	2,605
Intake	8:40	6	10	1,130	11,300	63	63	63	100	0.109	....	....	.....
Return	8:50	6	60	180	10,800	58	57	56	94	0.086	0.06	0.00	2,606
Intake	9:00	8	56	170	9,520	63	63	63	100	0.109	....	....	.....
Return	9:10	8	58	160	9,280	59	58	57	94	0.090	0.04	0.00	2,607
Intake	9:20	4	60	240	14,400	64	64	64	100	0.112	....	....	.....
Return	9:30	4	63	220	13,860	60	59	58	94	.....	0.05	0.00	2,608
Intake	9:40	5	60	280	16,800	59	58	57	94	0.090	0.25	....	.....
Return	9:50	5	60	290	17,400	60	59	58	94	0.093	0.05	0.00	2,609
Intake	10:00	7	58	300	17,400	64	64	64	100	0.112	....	....	.....
Return	10:20	7	60	340	20,400	60	59	58	94	0.093	0.05	0.01	2,601
.....			65	860	55,900	..	..	..	..	....	....	....	.....
Intake	10:30	Main	63	800	50,400	69	65	62	81	0.107	....	....	.....
Intake	10:40	Main	65	760	49,400	69	65	62	81	0.107	....	....	.....
	7:30	Outside	..	.....	.....	60	53	47	63	0.062	....	....	.....
	10:50	Outside	..	.....	.....	68	56	48	47	0.060	....	....	.....

Split No. 8 = 3d right heading No. 2 north.
Speed of fan 60. Blowing. (Steam). Mine working.

series of samples taken from a certain split every 30 min. for 10 hours. The results obtained were:

RESULTS OF GAS ANALYSES.

Time.	CO_2 Per Cent.	CH_4 Per Cent.	Cu.Ft. Air per Min.	Cu.Ft. Gas Gen. per Min.
3:10 p.m.	0.080	0.335	33,320	112
3:40 p.m.	0.065	0.340	32,708	111
4:10 p.m.	0.095	0.325	30,396	99
4:40 p.m.	0.040	0.340	32,436	110
5:10 p.m.	0.080	0.350	31,416	110
5:40 p.m.	0.085	0.335	31,756	106
6:10 p.m.	0.090	0.335	31,892	107
6:40 p.m.	0.035	0.360	32,028	115
7:10 p.m.	0.065	0.325	33,932	110
7:40 p.m.	0.060	0.330	32,844	108
8:10 p.m.	0.055	0.355	34,408	122
8:40 p.m.	0.075	0.345	34,000	117
9:10 p.m.	0.065	0.335	35,632	119
9:40 p.m.	0.060	0.345	34,816	120
10:10 p.m.	0.080	0.315	35,156	114
10:40 p.m.	0.075	0.315	32,232	101
11:10 p.m.	0.065	0.330	33,048	109
11:40 p.m.	0.050	0.315	32,232	102
12:10 a.m.	0.065	0.325	34,408	112
12:40 a.m.	0.065	0.340	34,068	116

Another similar test showed:

Time.	CO_2 Per Cent.	CH_4 Per Cent.
9:50 a.m.	0.040	0.230
10:20 a.m.	0.040	0.230
10:50 a.m.	0.040	0.240
11:20 a.m.	0.040	0.290
11:50 a.m.	0.040	0.250
12:20 p.m.	0.040	0.250
12:50 p.m.	0.040	0.230
1:20 p.m.	0.050	0.240
1:50 p.m.	0.050	0.240
2:20 p m.	0.040	0.220
2:50 p.m.	0.060	0.210
3:50 p.m.	0.050	0.190
4:00 p.m.	0.040	0.190

Upon starting up a fan after it had been shut down for repairs for 45 hours, samples were taken at the main return at certain intervals during the day. On starting, the analyses showed the return to contain 0.40 per cent.; in three hours this had been reduced to 0.33 per cent.; in five hours to 0.25 per cent.; in seven hours, to 0.17 per cent., and in 12 hours it had become normal for that mine, about 0.06 per cent.

The effect of increased quantities of air on the percentage of gas carried is illustrated by the following actual results:

The quantity of air in a certain split was increased gradually from 17,000 to 24,000 cu.ft. per min. The analyses taken showed:

With 17,000 cu.ft. of air the percentage of CH_4 was 0.37.
With 18,000 cu.ft. of air the percentage of CH_4 was 0.34.
With 20,000 cu.ft. of air the percentage of CH_4 was 0.29.
With 22,000 cu.ft. of air the percentage of CH_4 was 0.19.
With 24,000 cu.ft. of air the percentage of CH_4 was 0.16.

Another mine had a split carrying 32,000 cu.ft. of air per min., which showed 0.33 per cent. of CH_4. The volume of air in this split was increased to 37,000 cu.ft., and the percentage of gas decreased to about 0.22 per cent.

Gas was Given Off Practically the Entire Length of an Old Split

At another mine a certain split, near the main return, persistently showed from 0.34 to 0.38 per cent. of gas, CH_4. An effort was made to determine whether this gas was given off from one or two particular localities, or whether it was gradually accumulated. Samples were taken at certain advantageous points beginning at the intake which showed the following results:

1,700 ft. from the beginning of the split the percentage of gas was 0.018.
3,870 ft. from the beginning of the split the percentage of gas was 0.065.
4,920 ft. from the beginning of the split the percentage of gas was 0.110.
6,160 ft. from the beginning of the split the percentage of gas was 0.184.
7,190 ft. from the beginning of the split the percentage of gas was 0.273.
9,760 ft. from the beginning of the split the percentage of gas was 0.285.
10,610 ft. from the beginning of the split the percentage of gas was 0.334.
12,430 ft. from the beginning of the split the percentage of gas was 0.349.
17,710 ft. from the beginning of the split the percentage of gas was 0.361.

These results show clearly that gas in certain quantities was given off the entire length of the split, although practically all the entries had been driven for at least three years.

Two charts, Figs. 7 and 8, show graphically the results obtained on two splits in different mines during the last year. These charts show the percentage of gas, the quantity of air and the barometric reading, the data taken weekly from March, 1908, to March, 1909. The air measurements and gas percentages fluctuate considerably as must be expected, and an increased quantity of air does not always show a decreased percentage of gas, but as a general proposition it works out very well. In July, Fig. 7, there was 28,000 cu.ft. of air with 0.30 per cent. of gas, but in August and September the quantity of air was increased to from 34,000 to 36,000 cu.ft., and the percentage of gas was reduced to from 0.10 per cent. to 0.22 per cent. In October the quantity of air again decreased and the percentage of gas increased. In December and January the quantity of air again increased with a corresponding decrease in the percentage of gas.

In Fig. 8 the action of another split is shown. During the first six months, with about 19,000 cu.ft. of air, the percentage of gas was about 0.22; during the last six months, by increasing the air to 22,000 cu.ft., the percentage of gas was reduced to about 0.15.

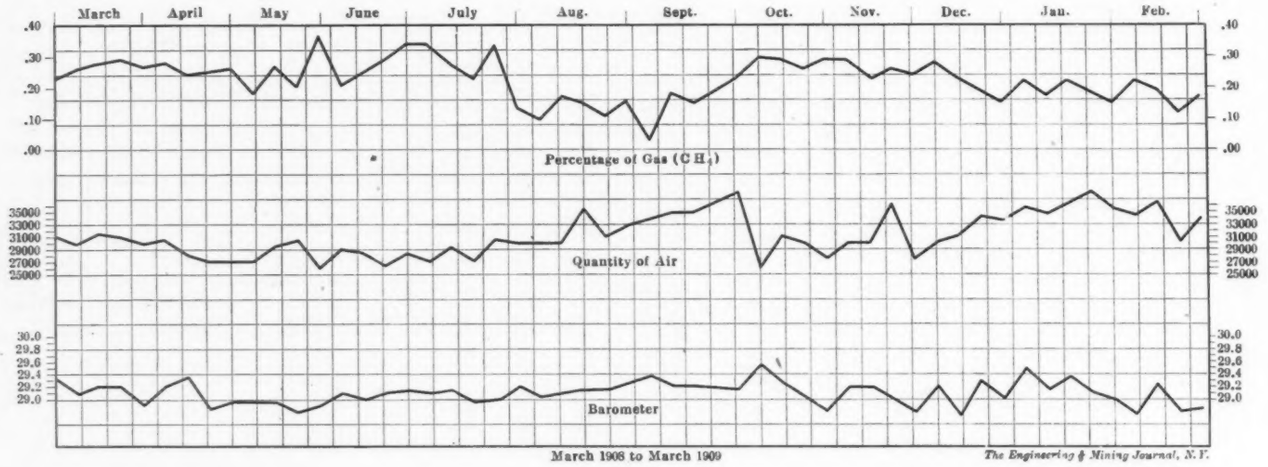


FIG. 7. SHOWING GRAPHICALLY THE RESULTS OBTAINED ON A SPLIT IN A MINE DURING THE PERIOD OF A YEAR

Investigations Are of Great Service

The net result of such investigations and reports, is to place before officials responsible for the safety of men and property, absolutely accurate and reliable figures showing the amount of air circulating in each section of the mine in relation to the quantity of gas generated in that district. It is then possible to distribute the total quantity of air produced by the fan to the best advantage and in such quantities as will do the most good. Such information is undoubtedly valuable and, if used intelligently, should be of material assistance in preventing explosions both of gas and dust, since by this method it is clearly shown that gas in considerable quantities is often present, although it cannot be detected by an ordinary safety lamp.

Since it has been determined that 2 per

cent. of gas present in a dusty mine under certain conditions is likely to be explosive, it is necessary that everything in human power be done to keep the percentage of gas down to a minimum.

The Coalfields of Alberta and Saskatchewan

By Phillips Thompson*

A great deal of valuable practical information in regard to the coalfields of Alberta and Saskatchewan is comprised in the report of D. B. Dowling, which appears in the summary report of the Canadian Geological Survey for 1908, recently issued. In addition to giving the results of an examination of the Cascade Basin, Alberta, and the lignite areas of Alberta, Mr. Dowling's report furnishes a general survey of the present condition and prospects of the coal-mining industry in the prairie provinces, as affected by the rapid settlement of the country and the progress of railroad construction.

Dealing with the steam coals of Cascade Basin, he states that at the time of his examination, the only mines in operation were at Canmore and Bankhead, but that prospecting carried on as far south as the Kananaskis river had resulted in the opening of several seams. On the Kananaskis slope and on the upper part of the measures near Ribbon creek, a branch of the Kananaskis, an examination was made, and analyses of outcrop samples were taken, showing that these coals can be classed with the Canmore product as steam producers.

A few of the former coals may prove harder, but none apparently go higher than semi-anthracite in grade. The result is gratifying, since on the main line of the Canadian Pacific Railway, the Canmore mine, capable of producing only 600 tons per day, was thought to be the only mine in the district that could supply steam coal. The number of seams discovered, as well as the undisturbed position of the measures, assure a large total of minable coal.

It is Estimated There are 60,000,000 Tons per Square Mile

Assuming that where the whole thickness of measures is present, there is an average of 90 ft. of coal capable of being mined, the available supply amounts to 150,000 tons to the acre, or 90,000,000 tons to the square mile. For the average of the area as mapped, allowing for dirty seams and coal left in the mine, approximately 60,000,000 tons per square mile would not be an excessive estimate. The largest and most important field is that lying north of Ribbon creek, where there is a natural terrace on which to erect the necessary mine buildings, and the coal seams being above the level of the river can be opened with drifts, affording natural drainage and easy haulage.

The total new area added to the steam-coal producing class may be roughly estimated at about 15 square miles, of which 6 or 8 square miles north of Ribbon creek is proved to have about 500,000,000 tons of available coal.

The principal mining center of Alberta for the production of lignite is at Edmonton, where the population is densest. Over a great part of the coal belt passing through this district there are numerous small mines from which statistics of output could not easily be obtained, as the market is purely local. The production of the Edmonton mines on both sides of the river, in 1907, is given at 112,558 tons, and is nearly all disposed of in the immediate vicinity. The mines, which will be called upon for a larger output to supply the towns outside the coal belt along the Canadian Northern and Grand Trunk Pacific railways, will naturally be those connected with the railway lines.

With the advent of these two roads, several companies have begun sinking shafts near the railways. Of these, the Parkdale in Edmonton was the first to begin shipping by car, raising the coal from a seam between 4 and 5 ft. thick, 200 ft. below the surface. A new mine, the Twin City, situated on the spur line connecting Strathcona with Edmonton had put down a shaft, and the Clover Bar mine was being connected with the railway. Numerous small operations in other parts of the province were being opened, mainly for local trade.

The general output of lignite for Alberta for 1907 is given in the provincial report as 639,335 tons, but this includes the product of the mines of Lethbridge, Taber and other localities, which I believe should properly be called lignite coal, and thus separated from the true lignites. As the principal mines at Lethbridge and Taber produced 350,000 tons, it is probable that there should be deducted from the total about 400,000 tons, leaving an output of lignite amounting approximately to 240,000 tons. The lignite

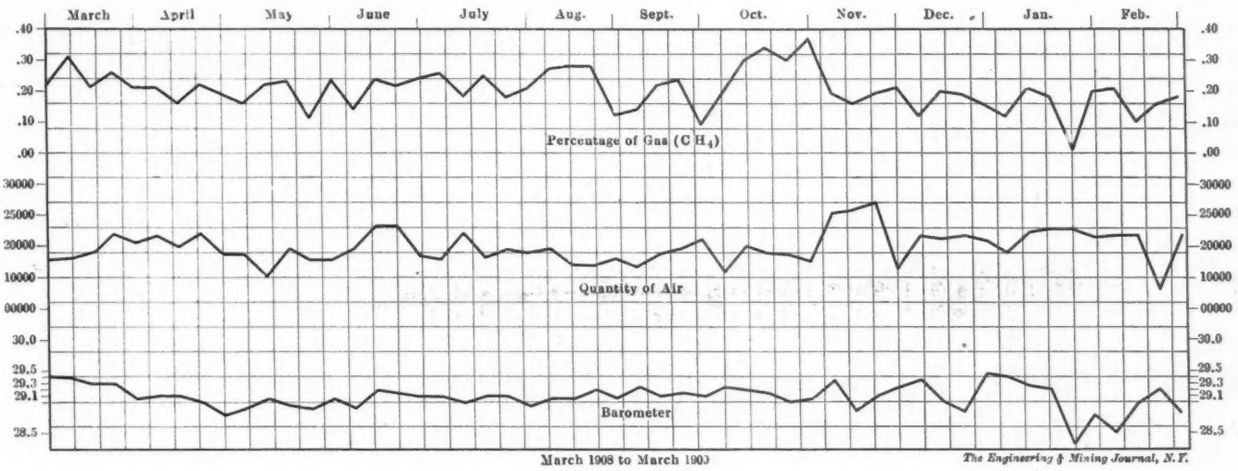


FIG. 8. CHART SHOWING RELATION OF BAROMETER AND QUANTITY OF AIR CIRCULATING, TO THE PERCENTAGE OF GAS PRESENT

Increase in Output Follows Increase in Population

The output of the coal mines of the two provinces of Alberta and Saskatchewan follows closely the increase in the population, and it is evident that if the present mines are working to their full capacity others must be opened in the near future. The need for domestic fuel is supplied mainly from mines in the lignite belt. The demand for railway facilities for the shipment of produce to market, means increased consumption of coal by the railways.

Following the increase in population comes the building of towns, and the establishment of factories, mills and other power-using works, so that not only production of Saskatchewan is considerably smaller, and it is of an inferior quality and mined merely for local consumption; efforts made by the provincial government to find a commercially valuable deposit have had little practical result.

*Toronto, Ont., Canada.

domestic fuel but coal for steaming and power will be in increasing demand. The output of anthracite has, up to the present, been confined to one locality, the Cascade Basin in the Rocky Mountains, and has risen from 23,363 tons in 1904 to 305,700 tons in 1907. The use of coal for steam power in railway transportation is divided between low-grade bituminous, lignitic coals, and the harder bituminous that are non-coking. The supply is delivered from all the Rocky Mountain mines, except the anthracite mines, as well as from those in the Lethbridge district.

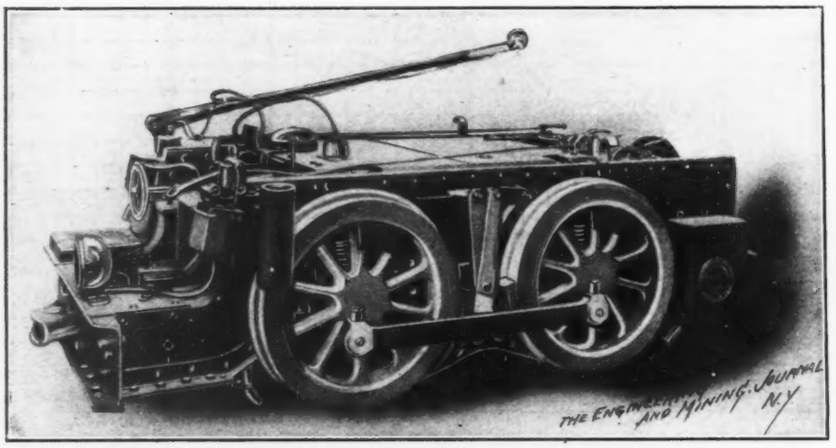
The complexion of the Grand Trunk Pacific Railway will call for a further advance in output within a year, to meet which it will be necessary to open up new mines. The coking coals are confined to the areas near the Rocky Mountains, the mines on the Crow's Nest branch and the areas to the north and south being the only producers of coke at present. Coking coal of the best grade has, however, been found north of the Saskatchewan, and when railway connection has been opened, British Columbia will be supplied from this source. The production of coke in Alberta was 71,292 tons in 1905, and 112,887 in 1907.

As a result of the rapid increase of population Mr. Dowling forecasts a considerable expansion in the production of lignite, basing his calculations on a comparison between the proportionate increase in the coal output and the growth of population in the past. The province of Manitoba which furnishes a market for lignite also imports coal and firewood from the East, and a portion of the coal supply of Alberta is brought in from British Columbia. However, making allowance for this, upon the assumption that the population of Alberta and Saskatchewan will equal in density that of Manitoba, it is within the bounds of probability that within a decade or two, a population of 3,000,000 may be found in the provinces between Ontario and British Columbia, to supply which, from coal sources, there should be a maximum annual output of 2,600,000 tons of lignite and the cheaper grades of coal.

Electric Mining Locomotive for the Clinchfield Corporation

The Clinchfield Corporation has recently placed in service 11 mining locomotives, which were built by the Baldwin Locomotive Works, and are furnished with electrical equipment supplied by the Westinghouse Electric and Manufacturing Company. Six of these engines are designed for a track gage of 3 ft. 8 in., while the remaining five are 4-ft. gage. The illustration shows one of the latter.

These locomotives are arranged for single-end operation, and are propelled by one No. 122 motor, which is geared to the rear axle. The two pairs of wheels are coupled by side rods. The frames are spring supported in the usual manner, and the wheels can adjust themselves independently to any inequalities in the track. At the same time, but one motor is required, all complicated gearing is avoided, and the driving mechanism is simple and positive in action. The side rods are arranged in accordance with steam locomotive practice, and are accurately balanced by counterweights cast in the wheel centers. It is believed that these are the first electric mining locomotives embodying these features.



ELECTRICALLY OPERATED LOCOMOTIVE FOR THE CLINCHFIELD CORPORATION

Gathering and Traction Reels

The equipment includes both gathering and traction reels. The gathering reel is of the usual type as built by the Baldwin Locomotive Works. It carries 400 ft. of single conductor cable, which is paid out over the front end of the locomotive. The traction reel is of the "Roan" type, and it is fitted with 300 ft. of ⅜-in. steel cable. The winding drum is mounted in a vertical position at the rear end of the locomotive, and is rotated by the propelling motor. By means of two clutches, suitably arranged, the reel can be operated while the locomotive remains stationary, or it may be thrown into gear while the locomotive is in motion. It is thus possible to haul cars out of sidings with the reel cable, and draw them up to the locomotive while the latter is proceeding along the main track, and this is accomplished entirely by the propelling motor.

The motor is placed between the axles and drives the locomotive through single-reduction gearing. It is spring-suspended from a cross-tie which spans the frames back of the first pair of wheels.

In accordance with the latest practice of the builders, the frames are of plate steel. They measure, in this case, ¼ in. thick, and are reinforced by 3x3-in. angles. The wheels have cast-iron centers with steel tires, and are placed outside the frames. The boxes are guided in cast-iron pedestals, which are riveted to the frames, and the weight is transferred to the boxes through coiled springs. The front and back bumpers consist of channel irons, to which are bolted suitable cast-iron draw-heads.

The equipment includes a hand brake, sand boxes with spouts for all the wheels, one gong and two electric headlights. The principal dimensions are as follows:

Wheel-base	3 ft. 8 in.
Driving wheels, diam	33 in.
Journals	3¼ x 4 in.
Width	3 ft. 11½ in.
Hight	3 ft. 5 in.
Length	10 ft.
Approximate weight	12,600 lb.

Coal and Copper in Turkestan

A correspondent of the *Torg. Prom Gazeta,* writing to the *Mining Journal* regarding the coal and copper industries of Turkestan, states that the actual production of coal in the area is 2,300,000 poods a year. There are three carboniferous areas, viz., Konine Saiska, in the Samarkand district; the Ispahan area; and Margellan, in the Ferghana district.

Copper is being mined on the banks of the Syr Darya river, about 18 versts from the station of Melnikoff, and 36 versts from Khokand. Here the copper ore is found in masses and in the original strata. The deposit is operated by the Syr Darynsk Mining Company, which is engaged at present in blocking out ore. A concentrating plant and smelter will be erected. Copper also occurs in the Margellan district, where the mines of Antonovitch-Palaschkoff & Co. are situated. Here the copper ore carries uranium, vanadium and radium. The deposit appears as a replacement in the limestone.

Safe Use of Electricity in Coal Mining

Brief Suggestions as to the Proper Voltage, Insulation of Electric Wires Underground, Automatic Trolley Switches and Return Circuits

BY GEORGE R. WOOD*

Commencing about the time of the Naomi, Darr and Monongah explosions, there has been a general house-cleaning regarding greater safety in mining operations, taking in not only the questions of gas, dust and rock-falls, but also the use of electricity with respect to danger of ignition of gas and dust, also the liability of electric shock to the men.

About this time it began to be definitely decided by a large number of practical mining men that dust was a large factor, if not the initial one, in some mine explosions, and the chain machine, which is almost universally motor-driven, was blamed for producing a large amount of dangerous dust. Some interesting figures have been obtained by Mr. Randolph, formerly with the Pittsburgh Coal Company, regarding various percentages of dust from hand, puncher machine and chain machine mined coal. The results found in each case have been reduced to the number of pounds of dust per square foot undercut, and the dust gathered was screened through a 40-mesh screen. At the mines of the Washington Coal and Coke Company, which are on the lower edge of the Connellsville region, the results obtained are as follows:

By hand mining, 1.80 lb. per sq.ft. undercut
By puncher machine, 4.58 lb. per sq.ft. undercut.
By chain machine, with pick-pointed bits, 1.48 lb. per sq.ft. undercut.

At the mines of the Westmoreland Coal Company the puncher machine gave 6.18 lb., and the chain machine, with the standard chisel bits, gave 2.43 lb. of dust.

At the mine of the Pittsburgh Coal Company, Midland No. 1, the chain machine gave 2.43 lb. and 2.51 lb. at two different trials, and the puncher machine gave 6.18 pounds.

There is no disputing, of course, that the puncher machine will cut more large coal, or in other words that the average coal cut by the chain machine will be smaller than that cut by the puncher or by hand, but the amount of coal cut out in undercutting by the puncher is so much greater than the amount taken out by the chain machine, that the actual amount of dust will be greater, as given above.

Igniting Fine Dust by an Electric Arc

It has been repeatedly attempted to ignite very fine coal dust by an electric arc. I have, no doubt, but that this can be done, but up to the present time it has not been done, so far as I know. I am inclined to think that if this ignition occurs, it will be with the distillation of gas from the dust by the heat of an electric arc. There is, of course, not the slightest doubt but that an electric spark of almost any potential will ignite gas in proper percentages, since we have an illustration of this in practically all automobiles. It is probable, to my mind, that an explosive mixture could be ignited from the minute spark from the ordinary signal wires where ten or more cells of battery are used. Electricity in itself will, of course, not explode and will not arc except when a circuit-carrying current is broken, and the requirement in the case of gas is simply to dilute the gas with air below the point of possible ignition.

In a mine generating explosive gas in large quantities, it is advisable to keep all electrical wires, and so far as possible, electrical apparatus on the intake air. It is only in most extreme conditions that an explosive moisture can be found in the return air, but it may be in case of falls of rock or in drawing pillars, that there would be a large quantity of gas liberated which might temporarily raise the percentage of gas in the return to a dangerous point.

The Danger of High Potential Electrical Currents

There has been a great deal of argument regarding the danger of high potential electrical currents, and during the past few years there have been a large number of plants installed, and in some cases changed over, from 250 to 500 volts. There can be no question to my mind but that 500 is very much more dangerous than 250 volts. There is also no question in my mind but that a large percentage of the electrical fatalities underground could have been, or can be prevented by proper methods of resuscitation after the shock. The paralysis of heart and lung action is similar to that in case of drowning, and some valuable results have been obtained by artificial respiration and other work which tends to restore circulation and to stimulate the heart action.

I know personally of one case in which a boy was shocked at a point about a mile underground. The body was placed on a pit car and brought out with a trip, and when outside, it was suggested to try artificial respiration and other remedies, as shown by an illustrated card, published originally by the *Electric World and Engineer* some four or five years ago. This was done and after 15 min. hard work, or a period of almost half an hour after the shock, their efforts were rewarded by bringing the boy back to consciousness and he was at work the next day. There is absolutely no question but that the victim would have died without this aid.

Nearly all cases of electrical shock have resulted from mometary contact with the wire, which stuns or knocks the man away from the wire, and in almost all such instances, I believe the subject could be revived. Cases are on record where persons apparently drowned have been revived after as much as an hour's work, without any apparent signs of life, until at the expiration of this time. I would earnestly recommend the placing of an illustrated chart, showing methods to be employed in case of electric shock, at and about all mines using electricity.

I notice on looking over a report of the Bureau of Mines for 1907 that there were 23 cases of death from electric shock. In every case this was received from the trolley wire, and in the majority of cases while crossing under the wire, either over cars or on the ground. The potential in all cases was 500 volts or over, and in one additional case, which is not rated as an electrical death, the man was knocked under a trip of cars by shock from a 250-volt wire. During the past year a commission appointed by the Governor of this State drafted a new mine law, and in connection with the electrical section of this law a committee was appointed, representing the operators and electrical manufacturers, to assist the commission in drafting an intelligent and effective electrical section of such law.

At the suggestion of Mr. Roderick, of the Department of Mines, we took the New South Wales electrical law as a basis on which to work, and made such amendments and changes as seemed to be called for by the conditions in Pennsylvania mines. I believe this proposed electrical section covers the ground completely, and I do not believe it would be at all burdensome to the operators of the State, with the possible exception of that part relating to the use of electricity in a gaseous mine. The entire effect of this part of the law depends on the construction of the words "a gaseous mine." If, as some claim, the mine should be classed as gaseous when gas can be found by the ordinary safety lamp, then nine-tenths of the

NOTE—Paper read before the summer meeting of the Coal Mining Institute of America, Punxsutawney, Penn., June 29, 1909.

*Consulting electrical engineer, Park building, Pittsburg, Penn.

mines in Pennsylvania would be considered as gaseous mines, since this provision applies if gas is found but once under any circumstances, and this would place the mine on a gaseous basis for six months.

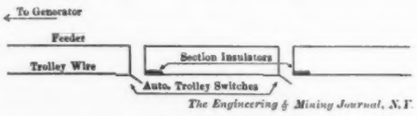
I cannot understand how there could be any objection to the use of locomotives on the intake air in any mine. If the mine was so gaseous that this would not be considered safe, I should not consider it safe to operate under any conditions. After every explosion, of which the cause is obscure, the natural tendency is to blame it on electricity, but so far as I am aware there has not been a single case where electricity has caused a serious explosion. It would, to my mind, show a poor system of ventilation and lax supervision of the electrical installation should such a thing occur. A properly wired mine is so connected and wired that any section, any room heading or cross-heading, or any point in the main heading beyond the last cross-heading, can be cut off should conditions become dangerous through falls or otherwise.

Safety of the Men

Returning again to the question of safety of the men, it has been considered useless for some years past to insulate electric wires underground, since there seemed to be no commercial insulation which was of value after a few years' use, or in some cases, a few months' use. It has, therefore, been preferred to use bare wires, even for machine lines in room headings, and depend on the miners' intelligence to recognize the danger of a bare wire. In some mines these wires have been protected by means of boards nailed to wooden plugs along the rib and the wires suspended behind these boards, also protected by wooden troughs where they cross over the heading. This protection is effective but very expensive and must be renewed at intervals of every two or three years in most mines.

At the testing station of the Geological Survey in Pittsburg the electrical department is making some experiments on various insulations subjected to extreme mining conditions. Cables with rubber and other insulations are submerged in acid mine water, readings taken of their initial insulation resistance, and these readings repeated at frequent intervals. The weakness of the insulation will be shown by the gradual or sometimes sudden drop in these values. This can be plotted on a curve, and the permanence of the insulation, commonly called varnished cloth or varnished cambric, will be effective under mine conditions, and I have used it in severe service for over two years, without any sign of trouble. This does not seem to be affected by acid and is perfectly moisture proof. The cost of this insulation will, I believe, be considerably less than the best rubber, and if the results obtained at the testing laboratory measure up to those I have found in practice, I believe it will be only a short time until we can confidently recommend that all machine wires carrying 500 volts or over be insulated, where carried on room headings.

Bare wires can, of course, be used where the wires are carried through air courses or off the traveled roads. So far as the trolley is concerned, it is out of the question to consider protecting this for its entire length. The methods of operation are such in present times that the haulage-way is seldom the traveling road, and where it must be so used, it can be driven wide enough to give a clear traveling space on the opposite side of the track from the trolley wire. At all places, such as partings, turnouts, and where the traveling roads cross the haulage road, the trolley wire can be protected by means of a trough or a single board projecting below the level of the trolley and firmly supported from the roof. In a large number of mines, all branches from the main trolley, on which but one locomotive works at a time, are sectionalized by the use of automatic trolley switches, which



ALL BRANCHES FROM THE MAIN TROLLEY, ARE SECTIONALIZED BY USE OF AUTOMATIC TROLLEY SWITCHES

cut the current off the branch except when the locomotive is working thereon. I think this is a valuable piece of apparatus, and recommend its adoption in all cases where it is possible to use it.

Mr. Clark, of the U. S. Geological Survey, has suggested an extension of the use of this device to the main headings, or long cross-headings of mines where but one locomotive is used. Mr. Clark's scheme involves the use of a feeder wire paralleling the trolley, but which may be placed, if desired, in the air course or parallel heading. This feeder and the trolley wire are divided into as many sections as desired, and one of these automatic trolley switches is placed in the trolley wire at each section point. The end of the feeder from the outside is connected to the center of this switch. The end of the feeder extending inward is connected to the end of the trolley of the same section. These connections are as shown by the accompanying sketch.

When the locomotive is inbound it will throw the trolley switch so that the next section of the trolley is connected, also the next section of the feeder, cutting out the section of the trolley which it has just left, but with the feeder, of course, continuously alive from the power plant to the section on which the locomotive is running. The result will be that the section of trolley on which the locomotive is running is alive, but no other, and on coming out not only the trolley but also the feeder is left dead behind the locomotive.

As noted above this arrangement would not be applicable where more than one locomotive is in use, since the trolley switches can only be operated in alternate directions. It would be possible to design a system so that a number of locomotives could operate in either direction and only have sections live on which they are operated, but this probably would not be satisfactory owing to the necessity for a number of feeders, whether required for carrying capacity or not.

Regarding the return circuits in mines, there is a good deal of misunderstanding on the part of mining men who are not well versed in the principles of electricity. Mr. Harrison, the chief mine inspector of the State of Ohio, has issued instructions forbidding operators from connecting pipes carrying air or water to the tracks, in other words he wants to keep these pipes entirely separate electrically, from the return circuit.

Preventing Electrolysis of Air and Water Pipes

I do not exactly understand his idea in doing this, although at one time he wrote me that if these were connected, there would be danger of shock to the men standing on these pipes if they should touch the trolley. It would be absolutely impossible so to insulate air or water pipes as to prevent shock from the trolley if standing on them, since there will be capacity enough in these pipes, even if completely insulated from the ground return, to give one a severe shock. In the Pennsylvania mine law we strongly recommend the very connection which Mr. Harrison condemns, chiefly for the purpose of preventing electrolysis of these pipes, which is bound to occur if they are parallel to the track without any electrical connection. Some of the current, seeking the path of least resistance, will leave the track and flow through the earth, and will select any metallic path traveling in approximately the same direction, the amounts of current in the different paths being inversely proportionate to the resistance.

It has been found by experiment that in many mines where the rails are in contact with the earth and the headings are wet with acid moisture, part of the return current, amounting in some cases to 60 per cent. is carried by the earth. Electrolysis in the pipes parallel and near to the track is caused by the current where it enters and leaves these pipes. In flowing through moist earth from the pipe to the rail it will carry part of the iron of which the pipe is composed into the earth toward the rail. This can be entirely prevented by using copper connections for the current from rail to pipe and back.

If the pipes are flanged with gaskets be-

tween the sections, each section should be connected or the pipe bonded around these gaskets. Mr. Harrison seemed to think that the operators would use these pipes to carry return current and thereby cheapen their return circuit, using smaller bonds or paying less attention to their maintenance. These pipes will, of course, assist materially in the return and I can see no particular objection to it. In disconnecting these pipes, there would be an arc if carrying the current at that particular time, but this arc would be of low potential, amounting only to the drop in that part of the return circuit, which would not likely be over 15 or 20 volts.

Use of Electric Lights

The use of electric lights in mines is strongly recommended, particularly at partings, turnouts, and all points where men must travel along or across the rails. In many cases these lights can be connected directly from the trolley and in connection with the use of automatic trolley switches, referred to previously, these lights will show when the current is on. It is advisable to have more than one circuit where lights are used as danger signals, to provide for burnouts of the lamps. In some of the mines, in the Connellsville region particularly, one or more red lights are installed at each danger point, in addition to the white lights which are connected back of these automatic switches. The white lights burn at all times, but the red lights show only when the current is on the wires at the parting.

It is surprising, with the large number of mining machines used, particularly in the western part of the State, that there have not been fatalities reported from contact with the machine cables. One explanation is, of course, that the men handling these machines and cables understand the danger from them and are on the lookout to avoid contact, whereas in the majority of cases of death reported by the inspectors, the victims walked against the trolley wire, or came in contact with it while climbing over a trip, at which time their attention was taken by something else.

275 Volts are Recommended

In all cases where large tracts of coal are to be developed I would recommend the use of 275 volts potential, using high-tension alternating-current transmission from the central plant, and locating sub-stations as close to the work as possible. Where the cover is excessive, these sub-stations can be located underground at the center of distribution. Such plants are in operation at Ehrenfeld, Penn., Kaymoor, W. Va. and Woodward, Alabama, in some of which the sub-stations are two miles underground. Wherever the cover is light, it would usually be preferable to have the sub-stations overhead and the direct current cables taken into the mine through bore holes.

Many mining men are possibly familiar with plants on the three-wire system, of which a number have been installed, chiefly in West Virginia. In these plants the current is generated by standard railway machines at 550 to 600 volts. The neutral tap is taken off these generators by means of proper connections to the windings from collector rings, and these taps by means of balancing coils furnish a neutral lead, between which and either main lead, the potential is one-half that of the generator. Apparatus in the mine is operated between either main lead and the rail, which is the neutral, and the maximum potential which can be received will be 300 volts. Stationary apparatus, such as fan motors, car hauls, large pumps, etc., can if desired be operated on full potential, or if a wide speed range is desired, motors may be operated first on 300 and later on 600 volts.

The wiring in the mine is so sectionalized that an approximate balance of load is maintained between the two sides of the system, and in the case of a perfect balance, the system is equivalent to a metallic circuit 600-volt transmission, using twice the copper as a grounded return system or one-half the copper as compared with a 300-volt grounded return system.

Where there are a large number of small units operated, such as locomotives, machines and pumps, a close balance may be maintained, and the efficiency of the transmission depends on the balancing, since with total unbalance it will be a straight 300-volt transmission. In actual operation at Ellsworth, Penn., and Minden, W. Va., the average balance is held within 15 per cent., with an occasional unbalance of 25 to 30 per cent.

An Alberta Coal Mine

Special Correspondence

The Alberta Railway and Improvement Company, one of the oldest and largest coal-mining companies in Alberta, operating the Galt colliery, is opening a new mine, known as No. 6, and situated in the northern section of the company's extensive coal area east of the Belly river and 2½ miles north of the No. 3 mine. The hoisting shaft is 20 ft. 2 in. by 21 ft. 2½ in., timbered with 10x10-in. square sets, backed with 3-in. plank; depth, 410 ft. The air shaft is 20 ft. 8 in. by 10 ft. in the clear, timbered similarly to the winding shaft. The railway, standard gage, has been extended from No. 3 to No. 6, and an electric-power transmission line built 3½ miles to the new power house. In the boiler house are two batteries, each of two Babcock & Wilcox water-tube boilers equipped with chain-grate stokers, and having a total capacity of 1000 h.p. The shafts and plant are being laid out with the object of developing 2500 acres of coal lands. The equipment is for a daily production of about 1600 tons of lump coal over a ¾-in. gravity bar, which will represent about 80 per cent. of the total run-of-mine output. The steel tipple will have cross-over pumps, screens, and a steel conveying-picking belt for hand picking the screened coal. An Ottumwa box-car cradle gravity loader is being put in. Hoisting will be in tandem cages, 2½ tons of lump coal at a hoist, with an average of three hoists a minute. Water supply is provided for by the establishment of a pumping station at Belly river, equipped with a turbine pump. Water is pumped through 6000 ft. of 6-in. water main to a 60,000-gal. water tower at the mine.

Co-operative Coal Mining in England

Special Correspondence

Copartnership between owners and employees has been brought to the front in England by a proposal made by Sir Christopher Furness, M. P., to introduce such a scheme at the Wingate colliery, County Durham. Some little time ago a similar scheme was introduced by Sir Christopher in the shipbuilding trade at Hartlepool, some particulars of which were referred to in the London letter published in the Journal Dec. 19, 1908. The coal-mining scheme provides that the men employed may obtain a quarter interest in the colliery. Every man has to agree to a deduction of 5 per cent. of his wages until his shares are paid for. It is hoped by the introduction of this schene to avoid strikes and lockouts.

To avoid disputes, a plan has been adopted, whereby all questions that might lead to friction shall be submitted to arbitration. The colliery will be managed by a council upon which representatives of the owners and of the men will sit, and a court of arbitration will consist of members of this body and will be presided over by a county court judge whose decision in the last resort will be final. The raising of the money to purchase the quarter interest in the colliery is a problem that has to be solved. It is hoped that the Miners' Union, which has accumulated capital, will be ready to make the investment on behalf of the men, but failing that, Sir Christopher Furness and his friends have intimated that they will provide the requisite amount, which will be gradually repaid by the 5 per cent. deduction from the workmen's pay.

The movement is one which must tend to minimize the danger of industrial storms, and it is to be hoped that the offer now being made will be accepted by the men, and that it will have a successful issue and lead other employers to introduce similar schemes all over the country.

Recovering Abandoned Coal Pillars

Early Operators in the George's Creek Field Left 60 Per Cent. of the Coal Seam Unmined. Efforts Are Being Made to Extract This Coal

BY W. L. HAMILTON*

The universal tendency of the present day is toward the conservation of the nation's resources, and vast areas of timber, coal, and low-grade ores, which were not thought worthy of attention two decades ago, are now being converted into wealth by a new generation of men who fully realize the importance of the complete utilization of all the earth's products. In years gone by, no serious attempts were made along the lines outlined above, and it devolved upon the managers, engineers and superintendents now in charge of the mines, forests and other industries, where reckless waste was prevalent, to avoid as far as possible, these previous extravagances.

In this connection, I will attempt to show what is being done in the way of reclaiming a large area of Georges Creek coal which was worked between the years 1850 and 1885, and in such a manner that 60 per cent. of the fuel beds was left unmined and abandoned. The property referred to is situated in the eastern end of the Georges Creek field, contiguous to the town of Frostburg. In the early days of the region, it was owned by the McCullohs, and I understand that it was at their instance that the first opening into the coal was made.

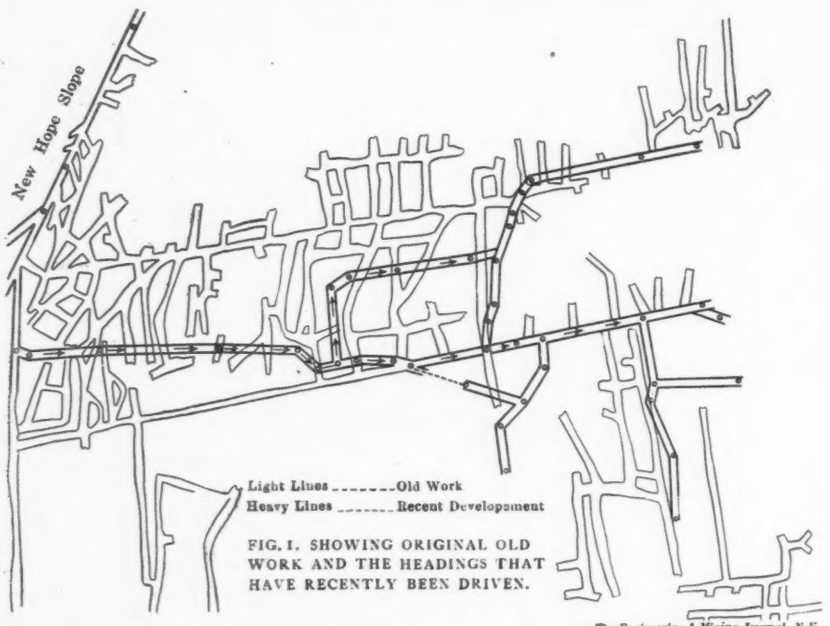


FIG. 1. SHOWING ORIGINAL OLD WORK AND THE HEADINGS THAT HAVE RECENTLY BEEN DRIVEN.

The Engineering & Mining Journal, N.Y.

This early development occurred in the year 1850. It was a slope opening, and is being used today by the operating company as their main haulway. About the year 1870, the property passed into the hands of the Consolidation Coal Company, who worked it until 1885, when it was abandoned. In 1903, H. V. Hesse, now general superintendent for the Consolidation Coal Company, came into the region as chief engineer for that company, and under his direction, surveys were made as far as possible, of all the abandoned workings, and preparations made to recover the pillars which were left in the ground. Mr. Hesse's task was an arduous one, as in some localities the falls were so bad, that it was necessary for the engineering corps to work all the time on their hands and knees, and not infrequently lying flat down; but perseverance won out, and today we have accurate maps of the despoiled territory, and are in position to win a large tonnage of coal, which in the natural order, will give employment to quite a number of men, will mean additional resources to the common wealth, and to the nation, and will be a valuable incentive to future engineers and mine managers. In 1906, Mr. Hesse was appointed general superintendent, and was succeeded as chief engineer by L. B. Abbott, who efficiently took up the work where Mr. Hesse left off.

The Present Work Was Started in 1907

In 1907 the Union Mining Company leased the property, and at once began to clean up the old slope, it being the most convenient way for them to reach the coal. Its length was 1300 ft., and there were bad falls throughout the entire distance. In some places large quantities of the big rock were down, and to get through this, forepoling and tunneling had to be resorted to. Selected hardwood timber was used, and notched sets were placed with 36-in. centers, down the length of the slope. In some of the more dangerous places, sets of 12x12-in. sawed oak were employed. When the bottom of the slope was reached, lyes for empties and loads were made on either side, to facilitate the handling of the output. The average pitch of the slope is 4½ per cent., and the coal is hoisted in trips of 10 cars, the gross weight of each car being 10,000 lb., and the hoisting is accomplished by a 75-h.p. steam engine, geared to a 48-in. drum.

Five months' time was necessary to complete the work described above. The services of 12 men were used, 6 working during the day, and 6 at night. Owing to the old heading being narrow, it was impossible for us to use a greater number advantageously. The total cost of the work so far, not including the hoisting engine or boilers, has been $3487. This work completed, it has been necessary for us to arrange a plan of action with regard to the removal of the pillars. To the left of the slope going down, a place was started in the coal, as shown in the map, Fig. 1. This ground was practically unknown to us, as it had fallen so badly that it was out of the question to survey it. However, we were convinced that some coal could be secured in this locality, and we determined to develop it.

For a time it was discouraging, as we were handling considerably more dirt than coal, and to make the matter worse, water was encountered, and it was necessary for us to install a 4-h.p. gasolene engine and pump, and to construct 600 ft. of ditch, in order that the section could be unwatered. For a distance of 720 ft. this unprofitable work continued, then we began to get into the pillars, which justified us for the extraordinary development expense.

At this writing no robbing has been done on this side. Four places are now working. They are all advancing, and it is our intention to keep them so until we reach a point where we are fully satisfied that the coal has all been extracted.

Details of Operations

To the right of the slope going down, the main heading shown by the long straight dotted lines in Fig. 2, was cleaned for a distance of 3000 ft., and was put in

*Assistant mining superintendent, Union Mining Company, Mt. Savage, Md.

shape to be used as our main haulway. The rooms marked "B" and "C", Fig. 2, and an additional room further down were also cleaned and timbered, and good substantial track was laid in them, as it was our intention for them to be used as auxiliary haulways, for the sections of the coal contiguous to them.

Neither the main nor the auxiliary haulways were expensive cleaning, as the falls in them were not so bad as those encountered in the slope, or in the locality to the left of the slope. The room *B*, Fig. 2, was in shape first, and robbing was begun gob *H*, to get across to the pillar *J*. This was done by the miners on a contract system, which will be explained, as it may be interesting.

Work Is Done on Contract System

When the place is "holed" the miners send for the foreman, who comes and measures the hight and the distance across the gob. We use a 48-in. track gage, and it is, therefore, necessary for us to carry a width of 8 ft. These three measurements are used, and the contents of the fall in cubic yards is thus arrived at.

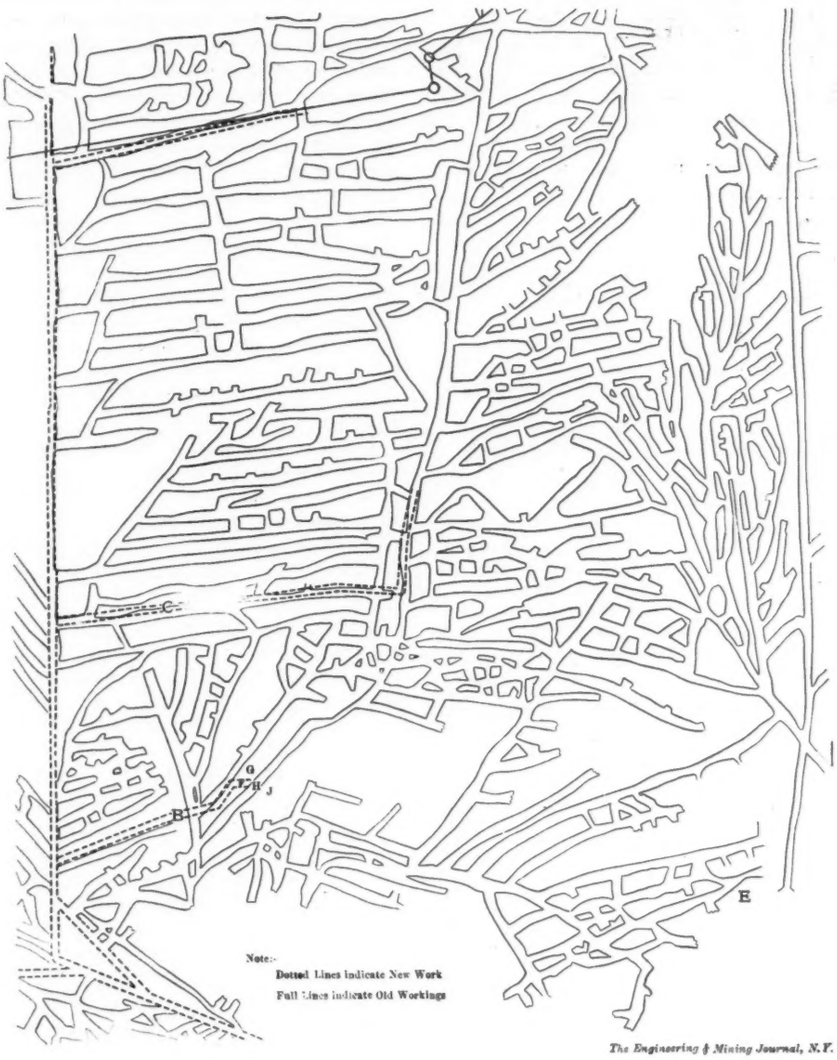


FIG 2. SHOWING 3000-FOOT MAIN HEADING OPENED UP, AND 3 ROOMS TURNED TO RIGHT FROM THIS HEADING

in this territory. The reader will understand from the accompanying maps, that all the work not shown in heavy lines was done years ago, and all of it contained falls more or less serious. The width of the old places averaged 15 ft., and the falls in them, about 9 ft. high. In the room *B* we advanced our cleaning to the point *F*, and the miners were started on a tonnage basis. After driving through the pillar *G* it was necessary to clean the Thirty cents per yard is paid for cleaning away the dirt, laying the track and setting the necessary timber. Our miners have become very proficient, and make good wages at the work. Our system accomplishes two things: First, speed in the removal of dirt; second, it does away, to a large extent, with the services of an overseer, as it is to the miners' interests to do the work as expeditiously as possible.

At this juncture I will explain the system of timbering used when cleaning these old places. The plan is shown in Figs. 3 and 4. When the coal is all taken out of the face of the pillar *G*, Fig. 2, two long stringers are first used. They are inserted in holes made in the rib of the pillar *J*, and supported by legs at each corner of the pillar *G*. Notched sets are then put at right angles to the stringers, and wedged to them. In some instances, where the rock is bad, props and caps are set on top of the large sets to support the cover. The sides are lagged, as shown, to keep back waste. Occasionally some of the dirt is stowed on top of the timber as shown at *X* in Fig. 4. This style of timbering has given us the best results, and when the crush comes, incident to the coal being removed, these crossings are the last points to be affected.

A Regular Line of Fracture is Maintained

In Fig. 5 is shown the methods used in attacking the pillars. Great care must be taken to avoid any abnormal crushing, as the pillars are small, and in all probability would be lost if this condition arose. To prevent happenings of this kind, we always endeavor to maintain a regular line of fracture, at about 45 deg. to the line of dip. The coal must be entirely removed, as a small pillar containing as much as 6 or 8 tons would act as a lever to hang the fall, and probably cause disastrous results.

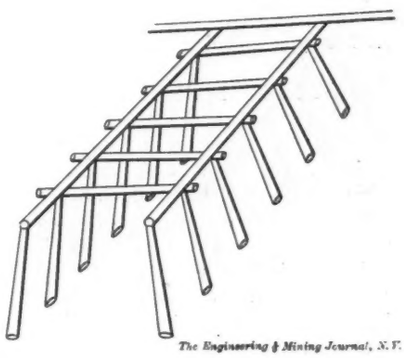


FIG. 3. ROUGH SKETCH SHOWING SYSTEM OF TIMBERING

Just as soon as a cut is taken off, we make it a point to get a good rock fall, close to our next point of attack. The heavy lines in the figure show the haulways; the small arrows in the haulways show the direction of the loaded cars to the bottom of the slope. In this work three extraordinary conditions are encountered: The first of these is the royalty; second, is cleaning old falls, and lastly, the excessive timber cost. The total charges against the tonnage produced for all three items, averages about 25c. per ton. We have to be especially careful with regard to the timber used. It must

be hardwood, and we require all props used in this work to be at least 4½ in. under bark on the small end. So far as we have gone, our recovery has been highly satisfactory, averaging 90 per cent. The underground work at the mine is in charge of S. J. Aldom, and he has handled the unusual conditions creditably.

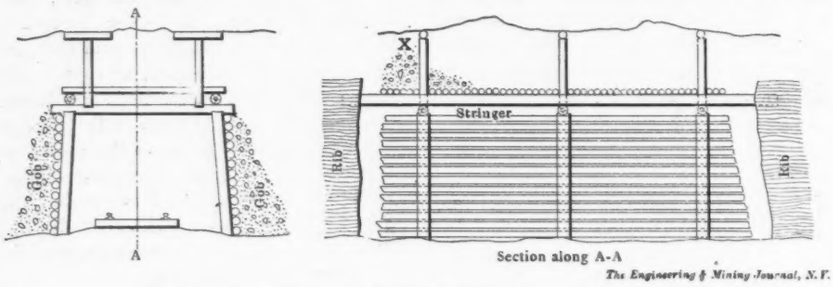


FIG. 4. A DETAILED VIEW OF THE SYSTEM OF TIMBERING OLD PLACES THAT ARE TO BE CLEANED UP

Mine Inspection with Respect to Car Allotment*

By H. B. Douglas†

During the year 1845, there was produced in the United States 2,500,000 net tons of bituminous coal. In 1907 the yearly production had grown to 360,000,000 net tons. There was also produced in this latter year 72,000,000 net tons of anthracite. Since 1885 the soft-coal industry has increased fivefold; and this by no means represents the growth of development. In the meantime railroads have not increased their equipment to meet the requirements of such rapid development; and while this restriction of output has doubtless been of great benefit to the producer, the question of car distribution has always caused more or less friction to all parties concerned.

About three years ago the necessity for some well defined method of car allotment became apparent, and, in point of fact, imperative. There was no concerted action in the matter, each road quite naturally preferring to work out the problem for itself. It was generally conceded, however, that mine capacity should be a factor in the result; and to this end a position, new to railroad operation, was created—that of inspector of mines. To fill this position men were selected of technical training; experience in mining and handling coal; and of approved personal and professional integrity.

Classification of Mines

It is the duty of the inspector to examine thoroughly all mines within the boundaries of his territory as often as circumstances require, and to pass on their capacities. For him mines are divided into three grand classes: 1. Mines in the early stage of rapid development. 2. Mines that have reached a maximum development. 3. Mines in which development has ceased. Mines in the second class have generally reached a capacity which may be maintained for years, and only occasional inspections are required. With class 1, in which the capacity is increasing, and class 3, in which the capacity is falling off, more frequent inspections are necessary. A mine's capacity is the amount of coal it can produce under favorable conditions with the means at hand. There are three factors which govern it, namely, development, haulage and tipple. As the speed of a fleet is that of its slowest vessel, so is the capacity of a mine determined by its weakest factor.

The developed capacity depends primarily upon the number of available working places, number of men to a place, and the tonnage rate per man. By available places we mean such as are working, or are in a condition to work without unusual delay. Headings and rooms drowned out, caved in, or with track lifted, are not considered available. Neither are rooms to the dip, in thin seams where the miner delivers the coal to the heading. With a string of pillars, only as many as can be practically worked under existing roof conditions are regarded as available. By tacit consent, the labor question does not enter the proposition at all. It is too elusive; and the inspector considers the mine under examination as being in the ideal state of having, at all times, a full quota of men. Equipment, drainage, and ventilation indirectly affect the result in that they influence the rate per man, as shown by the company's books. The number of men worked to a place in a given mine varies with the method of mining, and local conditions. Whether a mine has a full quota of men or not, there is always a certain number of places standing idle for this or that cause; and some roads take this into consideration in determining the developed capacity. One of the large trunk lines deducts 15 per cent. which is not unreasonable. The developed capacity with this deduction therefore becomes:

Number of available working places × men to a place × rate per man × 85 per cent.

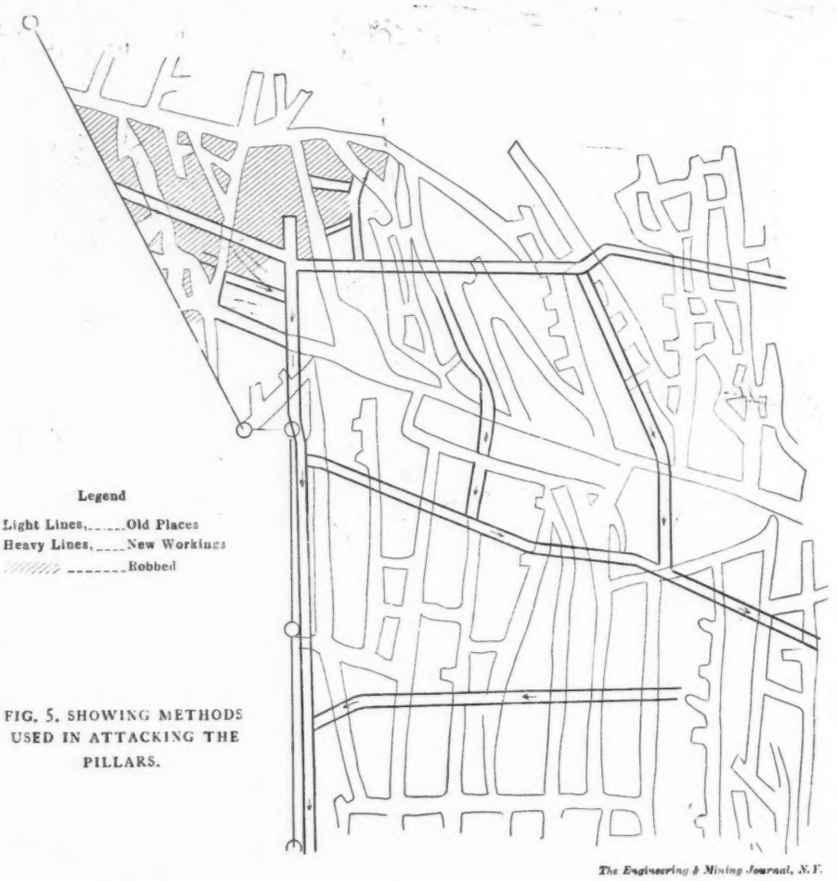


FIG. 5. SHOWING METHODS USED IN ATTACKING THE PILLARS.

The Haulage Capacity

Aside from the kind of haulage in use,

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its efficiency is affected by length of haul, gradient, weight of rail, condition of roadways, location of sidings, and number and capacity of mine cars. Whether the main haulage road is single or double tracked; and whether the working faces are scattered or concentrated, are also conditions entering the question of haulage capacity. With mechanical haulage it is customary to take the equipment as it stands and make an actual test under the most favorable conditions. With mules, however, the fact that the mine happens to be understocked at the time of inspection should not influence the result. Mule haulage is the most elastic we have. Its efficiency may be increased or diminished on short notice; and it remains only for the inspector to determine the maximum number of mules which may be economically worked, and the tonnage value of each, under such conditions as obtain at a given mine, in order to arrive at the haulage capacity.

Tipple capacity is governed by arrangement of tracks, grades, kind of dump and, if a shaft, length of hoist. It is sometimes necessary also to take into consideration the question of preparation. The logical place to clean the coal is, of course, at the working face, and this is, to a certain extent, done. But few coals come from the mine so clean as to require no further attention; and the inspector must determine the amount of time necessary to properly prepare the coal, as it is dumped into the railroad cars at the tipple. The railroad company is as much interested in the fair name of the coal it hauls to market, as the operator who mines and sells it. To each it spells revenue. As in the case of mechanical haulage, the tipple capacity is determined by actual test. One of the larger coal roads keeps on file outline sketch maps of each colliery, showing in color the development from year to year. These maps are of great interest, and, at times, of great value. As far as mine inspection is concerned, there is, perhaps, no material difference in the methods employed by the several railroads. The differences which do exist are rather of degree than of kind.

A Proper Method of Mine Rating

As to what constitutes a proper method of mine rating, this is, and probably will be for some time to come, a debatable question. The operators cannot agree upon it. It is impossible because so much depends upon the viewpoint; and the operators have many points of view. One operator prefers a rating based on tipple showing alone, and for obvious reasons. Suppose A, B, C and D are mining the same seam of coal. A has a pick mine; his coal is of good thickness, and is easily mined. On the other hand B, C and D are mining under adverse conditions. Their coal is perhaps thin and hard, and mining is done with the machine. A will have no trouble in filling his mine with the labor coming into the neighborhood; while B, C and D have to content themselves with what is left. Very frequently when labor is scarce—and it has been scarce the last few years—there is not much left for B, C and D. Under such circumstances the tipple showing of A is bound to exceed that of any of his neighbors, and might indeed be equal to their combined output. It is quite natural, therefore, that A should prefer a rating based on tipple results. At the same time the mine of B, C or D may show a larger development, a better equipment, and consequently a greater mine capacity. To base a mine rating on tipple showing under such circumstances would hardly be fair to B, C and D. This argument holds good with mines in different districts as well as with those in the same district. It is a discrimination against the thin-seam operator, regardless of his capital invested, which tends to drive him out of business.

Take the case of the operator who prefers to have the mine rating based on development alone. He advances the argument that the railroad company is unable to supply him with 100 per cent. of his car requirement when trade is flourishing; and considers it unjust, that, in order to get a rating equal to his development he is compelled to equip beyond the capacity of the railroad to handle his output. His contention seems reasonable enough, yet the argument against it condemns the method he advocates.

Let us suppose *A* and *B* to be operating the same seam of coal under like conditions. Each has a development of 1000 tons daily, and each plant is a duplicate of the other as to power, tipple facilities, haulage, equipment, etc. Apparently these mines have an equal value, and there seems to be no reason why each should not be rated at its developed capacity of 1000 tons daily. As far as the above description goes, it would be as fair for the one as for the other. But suppose A's development lies two miles from the tipple and B's a short half mile. Right here enters the question of haulage efficiency, and it cannot be ignored. It would be manifestly unfair to B to rate these mines on development alone. You might as well disregard development and rate the mine on haulage capacity alone, or tipple capacity alone, for the very nature of the case demands that these three factors have equal value. The careful manager will always keep his development well in advance. It is good mining practice thus to provide a surplus which is at once available for contingencies. Such practice needs and should receive no premium.

Viewpoint of the Railroad

The viewpoint of the railroad is purely impersonal. It recognizes the impossibility of devising a scheme of mine rating so flexible as to suit every case; and each road selects that which seems best suited to its needs. As a result the methods employed in rating for car allotment vary somewhat. This does not apply to anthracite roads which employ no inspectors, and rate on past achievement only. It is the practice of each of the bituminous roads to divide the territory covered by its lines into districts for the purpose of car distribution. The rated tonnage of the entire field having been determined, the percentage value of each district is calculated. In like manner is determined the percentage value of each mine in the district to which it belongs. The available cars are allotted to the various districts, and thence distributed to the mines in accordance with the percentage so found. During business depression when many mines are shut down, cars are plentiful; but when the coal market is normal they are scarce, and all districts and mines are placed on a percentage basis, which is rigidly enforced.

To establish a mine rating two methods are used by the several roads with more or less variation. One of these combines capacity with tipple results. The tipple showing for an equal percentage period, say three months, during two consecutive years, is added to the mine capacity as founded by the inspector, and the result divided by three. This forms the rating for the following year. At the end of each year the earlier tipple result is dropped and a new one substituted, covering the same percentage period for the year just passed. When advisable, a new inspection is made and any change in the mine's capacity substituted in the calculation. This method has many advocates.

Rating on Capacity Alone

With the other method the mines are rated by the inspector on capacity alone, governed by the minimum factor. This method is used by one of the originating carriers. It is the policy of this road to have a mine inspected at any time, on request of the operator, and, if necessary, to make a new rating which goes into effect the first of the month following. This feature has the advantage of stimulating development, improvements, etc., inasmuch as it gives the operator a quick return for money so invested.

A new mine opening into a large tract is not at first rated, but given all the cars it can load, over a period, the length of which is determined by circumstances. This permits the operator to develop his mine rapidly and put it, as soon as possible, upon a paying basis.

An operator who has several mines in one district receives his quota to be distributed as he sees fit. It frequently happens during dull-market periods that he finds it more economical to bunch his men at one or two plants and let the balance lie idle. With some roads such idle mines are nonrated at once, or after the expiration of a given period of time. This road, however, allows the rating of idle mines to

stand, and their car allotment is diverted to the active mines operated by the same company. It insists, however, that these idle mines be kept in such condition as to be able to resume work at once when trade conditions warrant. Mines allowed to fill with water or to cave in, or mines which have been dismantled are promptly nonrated.

It might be argued that a rule of this kind is pernicious, because it permits an operator to open mines in order to get increased rating; but the facts preclude such contention. No operator is spending money to open and equip mines, keeping them continually in a workable condition, and letting them lie idle for the sake of a few extra cars. Keeping such mines in constant repair is, at its best, expensive work; and the operator is willing enough to start them up when the market is again normal. Just so long as the idle mines are *bona fide* operations, and just so long as they are at all times workable propositions, it seems only fair that the operator should get some returns from them in the shape of rating.

It occasionally occurs that by reason of a breakdown in machinery or for some other cause incidental to mining, a full day is not worked and cars stand over. These cars are not taken into account in making up the quota for the day following. Toward the end of each month an effort is made to equalize the allotment, and, as far as possible, square the car account for that month.

No contention is made that this method is the best that can be devised; but it appears it gives general satisfaction. In my opinion that method of mine rating is the proper one which satisfies the greatest number of conditions on any given road. If such a method is adopted and adhered to rigidly and impartially, it will go a long way toward satisfying the operator, who, whatever else he may demand, expects, and is entitled to, a square deal.

This paper has been prepared in the hope that others may be induced to take up and discuss a subject of such vital interest to both operator and railroad.

Colliery Notes

European colliery managers seem to concur in the opinion that miners employed to do rescue work should be paid for their time and traveling expenses during the period of training. It is also stated that greater interest is created if certificates of efficiency are awarded, and badges given to deserving men.

An examination as to the relative advantages of turbines and reciprocating engines for units of 1000 kw. capacity downward, resulted in favor of the reciprocating engine. The cost per kilowatt capacity, and the steam consumption per kilowatt output, both appeared to be in favor of the reciprocating engine.

When operating in foul air, the leader of a rescue party should examine the pressure gages every 15 min., in order to detect any loss of oxygen. It is further suggested that any surplus cylinders of oxygen carried for reviving purposes should be the exact duplicate of the cylinders carried on the apparatus; provision should also be made so that an exchange of empty cylinders for fully charged cylinders can be effected.

The shafts put down at the New Wellesley mines in Scotland typify the latest European practice. The Wellesley shafts are elliptical, being 27½ ft. long by 14 ft. 10 in. wide, inside measurement. The walling is of brick in cement, 18 in. thick. The shafts are divided by center, and two side buntons, or steel joints, so as to give two winding spaces 11½x8⅓ ft., and two end spaces for pipes, ropes and cables. The shafts are 1650 ft. deep to begin with, but will be ultimately carried down to 2250 ft. The Wellesley mine commands an area of about 15 square miles of coal under the sea.

The idea prevails among many mine managers that quick-running engines "knock themselves to pieces." For this reason they go to great expense building massive foundations and installing heavy engines when a small high-speed plant of the same capacity would occupy only about one-fifth the space required by the larger engines. Furthermore, a number of units all of the same size and make, with spare parts interchangeable, are to be preferred to one large engine and dynamo. Practice has shown that the best method of driving electric generators is to couple the dynamo directly to a high-speed engine, working under forced lubrication, and having large gearing surfaces.

For the purpose of exploration, a diamond bore was recently put down in the coal measures of the mining districts in Scotland. In searching for the lower or limestone series of coals, the bore reached the great depth of 4534 ft. The core obtained at the finish of the bore was barely ¾ in. in diameter. The total cost was about $34,854, equal to an average of $7.65 per foot. The percentage costs of the various items entering into the expense of this bore were as follows: Diamonds used, 42.05 per cent. of total cost; wages paid, 25.69; coals used, 4.44; carriages, cartages, repairs, etc., 1.80; core tubes, crowns, trap rings, nipples, plugs, etc., 1.87; tubes for lining, 5.56; ropes and stores, 2.14; contractor's gross profit, including depreciation of plant and material lost in bore, 16.45; total, 100 per cent.

In carrying on rescue work, those in charge should not overlook the temperature of the mines in which the work is being done, and the clothing of the men engaged in this work. Investigation has shown that it is impossible for a man to work in a place where the wet-bulb registers 85 deg. F., without suffering a rapid rise of body temperature, and consequent danger of heat-stroke. It does not matter what the dry-bulb temperature is, for the power of the body to regulate its temperature adequately depends almost entirely on the wet-bulb temperature. If the air is hot and wet, the rescuer cannot keep the body temperature down by the evaporation of sweat. It is, therefore, advisable that the leader of the exploring party should take the wet-bulb temperature in the mine, and if this temperature is over 80 deg. F., the men should not be exposed for more than 30 min.; the rescuers in such hot, wet atmospheres should be stripped of clothes as far as possible. The mouthpiece of the apparatus used in such a temperature should be of a kind that the man can detach with safety, in order to drink, so as to keep up the supply of water in the body for sweating. All men who are expected to do rescue work under such conditions as above described should be practiced in a chamber filled with hot, moist air, and observations should be made on their power to work, rectal temperature, need for drink, etc.

With reference to the problem of watering mines to prevent dust explosions, a number of engineers have lately condemned this system as inefficient, not only because of the increase in fatalities from falls of roof, but also because the explosions at the Reden, Radbod and other collieries in Europe and America, where the sprinkling system was in use, showed that this method of watering does not render dust innocuous. In dealing with this question, Mr. Frostmann, taking the case of the Reden mine in Germany, says that although the system of water did fail in the Reden mine, it must be admitted that this system was on account of the fact that sufficient attention had not been paid to the danger of the mine drying up through the large quantity of air passing in the cold season. The explosion at Reden took place on a Monday morning shortly after the descent of the miners. The mine had, therefore, not been watered for about 36 hours. The average temperature of the outside air was at that time about 26.6 deg. F. The air left the mine with a temperature of 78.3 deg. F. Each cubic meter of air, therefore, took up about 20 grams of water, if it left the mine saturated with aqueous vapor; and the total quantity of air, about 2200 cu.m., absorbed from the mine 44 kg. of water per minute, and, therefore, in 36 hours, about 95 cu.m. of water were absorbed. Under these conditions the mine would be quite dried up on Monday morning. The original firedamp explosion was thus extended by the coaldust and caused the loss of 150 lives. In order to avoid such accidents in the future, the mines are now watered during the night after they have been idle, and before the descent of the ordinary shift of miners.

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**Illustrated.*

Speculation in Copper

We have at several times during the last year referred to the unusual speculation in copper that has been going on, and its effect upon the market. Speculation in copper is, of course, no new thing. The copper-selling agencies of this country that buy and refine crude copper habitually take advantage of the London speculative market to sell Standard against purchases here, if market conditions indicate this to be a wise policy; or, on the other hand, they may purchase Standard in London, take delivery and bring the material to this country for refining. The London Metal Exchange, which in effect is international, inasmuch as a large part of its business emanates from this country, serves, therefore, as a balance wheel, and the prices for copper at New York and London can never be for a long time out of joint.

The unusual feature of the last year in copper speculation has been the participation of outside interests that have no direct concern with the metal industry, just as they have previously done in grain and cotton. Another class of speculators has become interested in the copper market on the ground that it experiences a more active movement, and affords greater opportunities for profit than do the shares of the copper-mining companies; well known American brokerage houses have publicly stimulated this speculation. Still another class undertakes speculation in the metal in London for the purpose of influencing the stock market here. From this it has resulted that the copper market, both of New York and London—which, as we have previously pointed out, are practically the same—is swayed by many conflicting influences.

There is even some speculation in refined copper in the New York market, but this is generally discouraged by the selling agencies for obvious reasons. Copper sold to a speculator is destined to be put on the market again, and the resale may spoil the plans of the original seller. It is indeed conceivable that an agency might come into competition with speculative copper held in storage at its own refinery. Nevertheless there are apt to be some overtures looking toward speculation of this kind that the agencies cannot well decline, and, indeed, upon occasions such transactions have actually been inspired by them. There is, moreover, a constant speculation in refined copper by the smaller fry of the metal business, while now and then manufacturing consumers cannot resist the temptation to take a flyer, and buying for more than actual requirements may offer their surplus in the market under certain conditions.

All of this injects a gambling spirit into the business in a staple commodity, which tends to upset calculations. As is well recognized, a modicum of speculation is by no means a bad thing, serving to temper the natural fluctuations and generally steady the market. The speculative purchases of the man of large means, who reasons from good grounds that copper is cheap and is prepared to finance his purchases for the long pull are of that character. On the other hand, the transactions of the speculator who buys or sells upon a narrow margin with the expectation that copper is quickly going up or down, and otherwise with no particular consideration of conditions, are fraught with considerable danger. We saw in the early part of this year how the liquidation of such speculative commitments precipitated a sharp decline and lately there has been something similar. We have repeatedly been surprised by evidences of the extent to which this speculation in copper has lately been carried. It is a condition that is ominous for the stability of the market. The latter will be assured only when actual consumption begins to check the accumulation of supplies, and the large transactions in the metal signify more than the mere transfer from one hand to another. That there will be any restriction of production there appears to be no hope, the output having increased steadily on a 13c. level. We can, therefore, look only to an increase in consumption.

Vital Questions Affecting Coal Mining

In this special coal number of the JOURNAL various engineers have discussed some of the more important problems that now confront the coal industry. The progress toward the solution of such problems has been greater during the last two or three years than in the decade preceding. This awakening has been caused largely by the recognition of coal dust as a factor quite as dangerous to

miners as inflammable and explosive gases.

Great impetus was added to the examination of problems affecting the safety of coal miners by the Courrières disaster in France, the Monongah explosion in this country and similar accidents in other countries during recent years. As a result of this agitation the French government has established an experimenting station at Lièvin, France, which installation is described in detail by M. Callot in this issue. The establishment of the French station was quickly followed by the installation of similar stations in other European countries and by one in this country, under the direction of the U. S. Geological Survey. If the work already accomplished at experimental plants can be taken as a criterion of what is to follow, there is no doubt that the final outcome will many times justify the steps that have been taken.

The work of these stations is of interest to all mine operators, and it is well that wide publicity should be given both to methods adopted and the results.

In addition to the experimental work being done by our Government, the larger coal companies and especially the Fairmont Coal Company are making independent investigations so as to be able to meet the local problems encountered at their mines. Mr. Smyth, chief engineer of the Fairmont Coal Company, presents in this number of the JOURNAL valuable results with reference to the regulation of gas in mine air currents. As is shown in the charts accompanying this article, an effort is being made to discover what relation, if any, exists between the flow of gases into mines and the variation of atmospheric pressure, as shown by barometric readings. It does not seem at the present time that any definite relationship of this kind has been established, but it is understood that future reports will give such corresponding readings in greater detail.

The question as to whether or not the use of electricity in gaseous mines should be permitted is discussed in this issue of the JOURNAL by Mr. Wood. This article is an able defense of those who believe that other causes than electricity are responsibile for our many recent disasters. Other writers in this number have dealt with subjects of almost equal interest to those already mentioned, and the commercial as well as the technical side of coal mining has not been neglected.

Radium as a Commercial Substance

The value of radium is said to be about $21,000 for a gram. For the benefit of our readers who are not familiar with that metric measure of weight, we will say that the nickel 5-cent piece weighs five grams. In the presence of this remarkable substance, interest in diamonds, rubies and other precious things fades into insignificance. What wonder then that miners, metallurgists and scientists should be seeking to produce radium?

We have observed recently reports of the operations of two concerns abroad. In one of them, Sir William Ramsay, consulting chemist to the British Radium Corporation, Ltd., describes his work on pitchblende from Trenwith, in Cornwall, and the successful extraction, by his own process, of the first British radium. Out of 2240 lb. of high-grade pitchblende concentrates he expects to be able to obtain something like 196 milligrams of radium reckoned as bromide. Sir William recommends the immediate installation of a plant for the regular extraction of radium.

It looks, however, as if the British Radium Corporation, Ltd., might be outdone by a Swedish company recently formed under the name of "Kolm" to acquire the patents of Dr. Gustaf Helsing. This company bases its hopes on the mineral "kolm," a kind of coal which is said to occur in alum schists in Sweden. Its ash contains 2½ per cent. of uranium. It is anticipated that a ton of "kolm" will give five milligrams of radium sulphate.

The deposits of "kolm" are said to be extensive. Are we to look for a *debâcle* in the market for radium? We recently reported the purchase of 7⅛ grams at $150,000.

The Distribution of Coal Cars to Mines

In times past there has been much discussion over the system—or lack of system—in the distribution of cars to producing coal mines by the railroads which haul their product.

It is true that on the more important and better managed lines a close watch is kept, and means have been taken to reform abuses, and to check and prevent the misuse of authority by divisional and other officers. This has been supplemented by the adoption of systems by which mines can be fairly and equitably treated. In times like the early part of 1908, of course, there was plenty of cars for everyone; but as business improves there is no doubt that the demand will again exceed the supply of cars, and strict discrimination will again be needed to secure justice.

In this connection the paper by H. B. Douglas, given on another page, will be read with much interest. It describes the method of rating mines for car supply adopted by a prominent road, and shows the care with which adjustments are made. The system of inspection described cannot be deemed inquisitorial, when the object is considered, and coal operators cannot object on this ground. To be just the railroad officers must know the facts in each case. It is encouraging to see that such a system can be put in use, and there is no doubt that it will operate fairly. Of course, there will always be complaints from some shippers in flush times; but where all are assured of a "fair deal" all must be satisfied in the end.

Mr. Obalski's Retirement

The retirement of J. Obalski from the position of chief of the Mining Bureau of Quebec, will be a distinct loss to that Province, although it will still retain some of his services as technical adviser to the bureau. Mr. Obalski has been in charge of the geological and other mining work of the Province for about 30 years, and during that time has done some notable work. To him is due the geological exploration and mapping of the Province, and his work and his writings have done much to aid in its mineral development. In recent years, since the extension of the northern limits of the Province he has been indefatigable in the exploration of the new region to the eastward of the Cobalt country in Ontario, and his reports will be the basis of the extensive prospecting which is sure to follow the opening of the Quebec section of the Grand Trunk Pacific, which will make those regions accessible. Perhaps we may consider as his latest achievement the revision of the Quebec mining law, which will open the new country to prospectors on equitable terms and will go far to prevent the locking up of large mineral areas which was possible under the old law.

McGraw-Hill Book Company

The book departments of the McGraw Publishing Company and the Hill Publishing Company have been consolidated under the corporate name of the McGraw-Hill Book Company, with offices after July 1 at 239 West Thirty-ninth street, New York. This consolidation brings together two of the most active publishers of technical books in the United States. The new company takes over the book departments of both houses with a list of about 250 titles, both industrial and college text books, covering all lines of engineering. It will continue as well the retail, importing and jobbing business of the two houses.

The officers of the new company are: President, John A. Hill; vice-president, James H. McGraw; treasurer, Edward Caldwell; secretary, Martin M. Foss. Mr. Hill is head of the Hill Publishing Company, which publishes the *American Machinist*, THE ENGINEERING AND MINING JOURNAL and *Power and The Engineer*. Mr. McGraw is head of the McGraw Publishing Company, which issues the *Electrical World, Electric Railway Journal* and *The Engineering Record*. Mr. Caldwell has been manager of the McGraw book department for several years and Mr. Foss manager of the Hill book department.

Chronology of Mining for June 1909

June 1—Frick Coke Company fired 1200 additional ovens in the Connellsville region.—Summer meeting of the West Virginia Coal Miners' Institute held at Elkins.—Hayden Stone & Co., purchased the Santa Rita mine.

June 2—The Morris Coal Company, Zanesville, O., resumed operation; 500 men are employed.—Plans of the reorganization of the Newhouse Mines and Smelter Company issued.

June 4—Strike of 400 men at the Charleroi coal mine ended; operations resumed.

June 5—Dominion Copper Company's property sold under foreclosure at Vancouver, B. C.

June 7—Annual meeting of the stockholders of the Amalgamated Copper Company.

June 8—The Yukon Gold Company completed a 70-mile ditch from Twelve Mile river.

June 9—A steamer carried away the lower gate of the lock in the Canadian canal at the Sault.

June 10—John D. Ryan elected president of Amalgamated Copper Company. Benjamin B. Thayer elected president of Anaconda Copper Mining Company.

June 11—Fire started in the Jumbo mine of the Pittsburg Coal Company near MacDonald.—Strike at the Iola, Kansas, smelter of the Prime Western Smelter Company.

June 15—The Ontario Government sold 15 tracts of land on the Gillies Limit, Cobalt.—Plant of the Nevada Sulphur Company, Humboldt, Nev., burned. Loss, $100,000.

June 16—Jones & Laughlin Steel Company closed deal for coal land involving an expenditure of $4,000,000.

June 17—Jameson Coal and Coke Company closed deal for 7000 acres of coal land near Fairmont, W. Va. Consideration $2,000,000.

June 18—A shipment of gold valued at $3,200,000 arrived at Seattle from Alaska.

June 21—Thomas Iron Company, Easton, Penn., announced an increase of 10 per cent. in wages effective July 1.—The same action taken by several other iron companies.

June 23—Explosion in mine No. 4, Lackawanna Coal and Coke Company, Wehrum, Penn.; 17 killed.

Gold from the North

SPECIAL CORRESPONDENCE

On Friday, June 18, there was received at Seattle, Wash., consignments of gold totaling about 200,000 oz. in weight and valued at $2,200,000. Advices were received of further shipments to the aggregate value of $1,200,000, these to arrive in a few days. Thus, total placer gold receipts at Seattle within a week or 10 days were of an aggregate value of about $4,400,000. Reckoned by the ton, this means that nearly 9 tons, avoirdupois, of gold reached the Puget Sound city recently. The gold comprising the first-mentioned shipments was chiefly from creeks in the Fairbanks district, Alaska, with a small proportion from the Canadian Yukon. That contained in the later shipments was from Nome.

Advices received in Seattle from Fairbanks and Tanana are to the effect that the clean-up this year will be the largest in the history of those camps. The dumps of pay dirt are the biggest yet accumulated—fully one-third larger than those of last season—and there is plenty of water for gravel washing. In other respects too, the season is favorable, including a richer pay average than in past seasons. The total output of these camps for this season is estimated at $12,000,000 to $13,000,000. The output for the season from Nome is estimated at least at $2,000,000.

In the Canadian Yukon six placer gold discoveries regarded as important, were made last year, beside several minor points. The former are: On Herbert and Log Cabin creeks, both in Forty-mile district; Glacier creek, in Sixty-mile district; Barker creek in lower Stewart, and Matheson creek, in upper Stewart district; and on Lower Thistle creek, along the Yukon. There is a distinct revival in the Klondike and the expectation is that from now on there will be a marked increase in its annual output of gold.

June Dividends

The accompanying table shows the total amount, and the amount per share, of a number of the more important dividends paid during the month of June, 1909, by mining and industrial companies in the United States, and by some foreign mining companies.

JUNE DIVIDENDS.

U. S. MINING COS.	Location.	A'mt. per Share.	A'mt. Paid.
Am. Smelters Sec., pf. A	U.S.	$1.50	$255,000
Am. Smelters Sec., pf. B	U.S.	1.25	375,000
Bunker Hill & Sullivan.	Ida.	0.15	45,000
Calumet & Hecla, c	Mich.	6.00	600,000
Champion, c	Mich.	2.00	50,000
Colorado, s.l.	Utah	0.08	80,000
Doctor Jack Pot, g	Colo.	0.00½	14,134
Doe Run, l.	Mo.	1.50	95,262
Elkton, g	Colo.	0.01½	37,500
Federal Sm., pf.	Idaho	1.75	210,000
Florence, g	Nev.	0.10	105,000
Granite Gold	Colo.	0.01	16,500
Homestake, g	S.D.	0.50	109,200
Iron Blossom, s.l.	Utah	0.08	80,000
Mary McKinney, g	Colo.	0.02	26,185
North Butte, c	Mont.	1.00	400,000
North Star, g	Cal.	0.40	100,000
Phelps, Dodge & Co.	U.S.	0.02½	1,123,365
Round Mtn. Min.	Nev.	0.04	32,000
Sioux Con., s.l.	Utah	0.06	52,247
Snow Storm, s.l.	Ida.	0.03	45,000
St. Joseph, l.	Mo.	0.15	150,000
Utah Copper	Utah	0.50	362,975

U. S. COAL AND INDUSTRIAL.	Location.	A'mt. per Share.	A'mt. Paid.
American Coal	Md.	0.375	17,187
Crucible Steel, pf	Penn.	1.25	304,456
General Chemical, com.	N.Y.	1.00	74,103
Maryland Coal, pf.	Md.	2.50	47,125
Sloss-Sheffield, com.	Ala.	1.25	125,000
Standard Oil	U.S.	9.00	8,730,000
U. S. Metal Selling Co.	N.J.	50.00	2,500,000
U. S. Steel Corp., pf.	U.S.	1.75	6,304,919
U. S. Steel Corp., com.	U.S.	0.50	2,041,512

FOREIGN MINING COS.	Location.	A'mt. per Share.	A'mt. Paid.
British Guiana, g	S.A.	0.08¾	17,500
Kerr Lake	Ont.	0.30	18,000
McKinley-Darragh, s.	Ont.	0.05	100,000
N. Y. & Hond. Ros.	C.A.	0.10	15,000

According to the *South African Min. Journ.*, March 13, 1909, since February, 1909, there has been a revival in the mining industry of the Zoutpansberg. During February 460 mica claims were staked in the Leydsdorp district, and 996 copper claims in the Magalakwin district.

According to statistics of THE MINERAL INDUSTRY the 1908 production of borax in the United States was 33,500 short tons valued at $177,500 against 48,444 short tons for 1907. In 1908 3067 short tons of boric acid ($406,767) and 17,115 short tons of refined borax ($1,537,688) were produced.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

An Independent View of a Recent Coal-mining Meeting

Having just returned from the summer meeting of the Coal Mining Institute of West Virginia at Elkins, it has occurred to me that the impressions of that meeting from the viewpoint of an independent engineer, not affiliated with any company or corporation might be interesting to your readers. The meeting was successful in every way; the time of year, the country, the clean-cut men, and the papers submitted combined to make it a most enjoyable occasion.

The most striking feature to the outside public was the maturity of the young men present, and one had but to listen to their papers and more especially to their answers during the discussions ensuing, to understand why such tremendous interests had been entrusted to them; alert, earnest, capable, it was a pleasure to hear them.

To illustrate what young "captains of industry" we have in this State, it is said that the oldest professional man upon the splendid corps of the Fairmont Coal Company is only 35, and that most of them are under 30.

These men were not dodging the issue of mine accidents or greater safety in their mines. It was plain to be seen that it was a living, vital question to them, and that they were seeking light and help from every conceivable source; also that they intended and were facing the situation with that manliness, courage and skill which will win out in the long run. It is evident that the mining companies are placing their interests in competent hands and that as the years go by, these hands and brains will accomplish greater results as they gain that maturity of judgment, which can come only with maturity of experience.

The State of West Virginia is squarely facing her responsibilities, and Governor Glasscock publicly stated that he was putting the question of proper inspection and competent inspectors up to the chief mine inspector.

Apparently this position of the Governor will give Mr. Laing the opportunity that has been denied his predecessor. He has started well by insisting upon the examination of prospective inspectors, and if he will see to it that these examinations are fair and sincere, and if he will divorce politics from the mining department, we shall hear in future quite a different story from his office. We wish him every success, and admire the bold stand he has already taken; we hope that the executive and legislative branches of the State government will work with him, and we are convinced that if they will do so, they will find the operators fair and reasonable and anxious to safeguard the mutual interests of State and owners.

S. H. Brockunier.

Wheeling, W. Va., June 3, 1909.

The Price of Labor

Mr. Finlay's "Investigation of the Cost of Mining Coal" in the Journal of May 8, 1909, wherein he makes the startling—one might say, heretical—statement that the "rate of wages is an effect and not a cause," is to be commended.

The price of labor emphatically is determined by the natural factors. And the labor cost is not a direct function of the rate of wages, as is so commonly believed. More often, it is the reverse. Low wages may mean high cost per unit, owing to a corresponding lack of efficiency, which Mr. Finlay points out.

Supply and demand of labor regulate the cost of the labor unit as surely and absolutely as the labor cost of a unit of production is regulated by the factors of management, as between two managements with the same natural factors to contend with.

A labor unit in a given district is the average daily work of an average laborer at a certain price per day. To raise this average work without raising the price is generally not possible, supply and demand remaining unchanged, (1) because the average man cannot do more; (2) why should he? To secure more work per day per man it is necessary to pay a premium, and get above-the-average men. This is an essential in obtaining the choice of any commodity. The ability to do this depends on the natural factors and on the skill of the management.

The thrifty and economical management with favorable conditions can bid more for labor, and choose the best, and with the increased output pay a profit on the added investment. The cost of labor has apparently increased, but it is safe to say that the labor cost of the product has not increased, while the increase in product and saving of time pay the interest and profit on the added capital.

The same is true of replacing labor with machinery. This will cause a readjustment of wages only in so far as the balance between supply and demand is disturbed.

Some will accuse Mr. Finlay of having substituted "cost of living" for "rate of wages" in his factor *e* in the list of factors which enter into the cost of mining coal. While the cost of living determines the so-called "living wage," the law of supply and demand determines what shall be the margin between living wage and the paid wage. That the margin becomes a negative quantity at times, is because of abnormal disturbances of the balance between supply and demand. The same is true, of course, of abnormally high wages.

It may be said that the cost of living—therefore, the living wage—varies so much that it is only a quibble of terms for Mr. Finlay to use "cost of living" and not "rate of wages" as his factor. The fact is that the living wage—a wage which will keep a man and his dependents alive, no more—varies little the world over. It is the margin between the living wage and the earned wage which varies with the variations of civilization and is the effect of natural local conditions.

Mr. Finlay's novel statement applies not only to the economics of mining but to the economics of all labor-consuming enterprises. When the products of the enterprises are not of the earth, but become manufactures, the "natural" factors become more or less artificial ones, but the rate of wages is none the less an effect, not a cause.

Walter Unzicker.

Cruz, Tamaulipas, Mex., June 9, 1909.

Zinc Mining in Butte

As a result of my short article, published in the Journal of May 1, 1909, describing the conditions connected with the mining of zinc ores in Butte, I have received numerous letters from different parts of the United States, Canada and Mexico, inquiring as to how zinc ores occurring in those localities can be treated; also from purchasers of zinc ores, and from others who have patented processes for the treatment of them. Some of these processes are specially adapted to separating iron pyrite from zinc pyrite.

The secret of the success made here in the wet concentration of the ores, occurring in the properties of the Elm Orlu Mining Company and the Butte & Superior Mining Company which adjoin, lies in the fact that the ore coming from these two properties contains a very small percentage of iron. An average assay of a large number of samples of crude ore and

concentrates from these two properties is shown in the accompanying table.

ZINC ORE AND CONCENTRATES.

	Au.	Ag Ounces.	Cu Per Cent.	Zn Per Cent.	Fe Per Cent.	SiO_2 Per Cent.	S Per Cent.
Crude ore.....	$0.40	12.0	1.0	21.0	3.0	8.0	....
Concentrates.....	1.00	25.0	2.0	46.0	5.0	10.0	28.0

Perhaps this information will be of value to those readers who have zinc ores which approximately correspond in their assay contents to the above figures. If the ore here contained much iron pyrite, it would be impossible to concentrate it and bring the zinc in the product up to 45 per cent. or over. There are no plants in Butte equipped to reduce either zinc ore or zinc concentrates, and the concentrates are, therefore, shipped to the zinc smelters in Oklahoma and other points. These plants, after treating the concentrates for their zinc contents, ship the residue containing the copper, silver and gold, to other smelting plants treating this class of material.

The development of the zinc veins in the Elm Orlu and Butte & Superior properties is proving entirely satisfactory. The Elm Orlu veins are constantly increasing their output, which necessitates the enlargement of the plant at the Butte Reduction Works to accommodate them. The Butte & Superior company is in position now to mine from 500 to 1000 tons daily of this class of material, and will do so as soon as arrangements are made for the necessary means of concentrating it. We find from our experience in the concentration of the zinc ores that the ordinary jigs used for treating copper ores do not give satisfactory results, and it has become necessary to devise specially built jigs for this class of material.

A. H. WETHEY.

Butte, Mont., June 17, 1909.

Determination of Alunite

I have no intention of criticizing in the main R. B. Gage's interesting and instructive paper on the "Determination of Alunite," in the JOURNAL of June 5, 1909, for articles of this kind are of great value. Yet it seems to me that the remark, toward the close of Mr. Gage's paper, that if alunite be present, a prospector "may prepare to sink deeper with a reasonable expectation of finding gold also," might possibly create a false impression. Alunite results from various causes and thus at times has no connection whatever with gold, a point which F. L. Ransome, who first identified the mineral at Goldfield, has emphasized, both in his letter in the JOURNAL of Jan. 16, 1909, and in his paper[1] on the Goldfield occurrences.

[1] *Economic Geology*, Vol. 2, p. 667.

The general geology and the conditions under which alunite was formed, must be taken into account, for this mineral, *per se*, is no more an indication of gold than is kaolin, with which it is often associated at Goldfield, or gypsum, which, likewise, may be due to the same agencies which produce alunite, lime being involved in the one case and potash and alumina in the other.

In course of time the detailed study of mining regions and the researches into the various phases of rock alteration may possibly lead to the discovery of reliable indicators for gold, but it appears to be a melancholy fact that in general, the only sure sign now known is the presence of the metal itself. The difficulties of an inquiry of this kind are greatly enhanced, as compared to the more common metals, as only an infinestimal amount of gold is required to make a payable ore; hence it is small wonder that gold occurs under many and varied conditions and that while certain general principles apply more or less to all gold-mining regions, each is, at least to some extent, a law unto itself.

The alunite at Goldfield would probably have been formed, gold or no gold, and from what I can learn all that can be stated with certainty as yet is that in some occurrences alunite is associated with gold, and in other it is not. Because this mineral is characteristic of the Goldfield deposits I cannot see that it necessarily follows that such should be the case elsewhere, for a statement, based upon observations in one or two localities only, may by no means, be of general application to all districts of similar rocks.

GORDON SURR.

San Bernardino, Cal., June 11, 1909.

The Upper Coal Seams Should Be Mined First

Having at various times visited many sections where coal is mined on a large scale, I trust that a few remarks advocating conservation along somewhat different lines will be acceptable. In western Pennsylvania, I find that the Lower Kittanning seam of coal, the Upper Kittanning, and in some places the Lower Freeport are being mined out, leaving the Upper Freeport bed in a very unsafe position to mine in the future.

I have frequently called the attention of mine operators to this matter, and suggested that the Upper Freeport seam should be mined first; then follow with the Lower Freeport, the Upper Kittanning, and lastly the Lower Kittanning. In this manner, everything under the coal seam that is being mined, would be solid, and it would be possible to remove all of the coal. Also by this method, subsidence of the strata would not be prolonged but everything would settle more quickly, and become solid, which plan of operation would be desirable under farms.

It is true, however, that the unwise system of mining one, or both of the underlying seams still continues, simply to meet the requirements of the trade, and to supply to it, that which is supposed to be the best steam-raising fuel. If such a method is long pursued, the ultimate result will be the virtual destruction of a seam of coal, that on an average will yield from 6000 to 10,000 tons of excellent coal per acre. J. R. HECKMAN.

Johnstown, Penn., March, 27, 1909.

The Application of Alternating Current to Coal Cutting Machines

Although universally recognized as of great importance, the application of electricity in mines has been somewhat retarded because coal-mining machinery could be operated electrically only by direct-current motors. This limitation has prevented the generation and transmission of electricity by the more economical alternating current except when transformed to direct current by a rotary converter near the point of application.

Henceforth the use of electricity in coal mining will be more wide-spread because of the development of the alternating-current motor. Distant water powers and advantageously located generating stations can now be utilized to a greater extent, for it is no longer necessary to transform the alternating current. This far-reaching development in coal-mining machinery is made possible by the application of an alternating-current motor to the Pneumelectric coal puncher. As a direct-current machine it has already reached a high degree of perfection, in fact it has been so successful that the Pneumelectric Machine Company, of Syracuse, N. Y., is now equipping it with an alternating-current motor of two or three phase, for any voltage or frequency.

This is said to be the first successful application of an alternating-current motor to coal-mining machines, and, although announcement of this motor has been made quite recently, it is not in the experimental stage.

All previous attempts to use alternating-current motors for coal-cutting machines have failed because of the great weight of the machine and the enormous amount of power required. With the Pneumelectric, however, the principle of operation has been shown to be so efficient that the power is reduced to one-third that of many other types of coal-cutting machines, thus allowing such a light motor that the complete machine weighs only about 800 lb. Notwithstanding this great reduction in weight and power input, the Pneumelectric is in no way inferior in its capacity for work. D. T. R.

Boston, June 22, 1909.

Rock Temperatures and Deep Mining

SPECIAL CORRESPONDENCE

In the report of the St. John del Rey Gold Mining Company in Brazil for 1908 Superintendent G. Chalmers gives some interesting information on the subject of deep mining. The lowest level—or horizon as the report calls it—is 4000 ft. below the main adit level. Owing to the poor provision of shafts the ventilation of the workings is a serious problem. The following statistics are given of the average rock temperatures at different depths, which are counted from the surface, in feet:

Depth.	Degrees.	Depth.	Degrees.
324 ft	70	2264 ft	80
624 ft	71	2524 ft	81
924 ft	74	2824 ft	84.5
1224 ft	75	3124 ft	82.5
1524 ft	77	3424 ft	86
1824 ft	79	3724 ft	88
2073 ft	78	4024 ft	95

Owing to the high elevation of the surface the 2824-ft. level is almost exactly at the sea level.

It will be seen that the rise in temperature is not proportional per unit of depth, but this is believed to be due to the holes in which the thermometers were placed being unsufficiently deep for the purpose. At some points the rock was exposed to a larger volume of air and was in consequence cooled to a greater extent than at others. Unless ventilation is provided, the workings will approximate in temperature to that of the rock, and, in order to make the mine fit for men to work in, large volumes of fresh air are required in deep mines.

It is estimated that if the St. John del Rey mine is worked to a depth of 6500 ft., as is proposed, the probable temperature of the rock at the lowest point will be some 19 deg. higher than at horizon 14, where it is 95 deg. With the present ventilation the miners can work with good efficiency, and it is anticipated that with adequate ventilation the workings down to 6500 ft. can be kept at a temperature very little in excess of that of the horizons now being worked.

The increased temperature of the rock demands also an addition in volumes of air; the power necessary to do this work does not vary directly as the volume, but as the cube, and directly as the length of airways. A large addition of fan power will, therefore, be required for the deeper workings.

Cement Production in Canada

SPECIAL CORRESPONDENCE

The Canadian Department of Mines has issued a statement based upon complete statistics received from the producers, showing the production of portland cement in 1908 and giving other information with regard to the industry. The total output from 23 operating plants for that year was 3,495,961 bbl. of 350 lb. net, as compared with 2,491,513 bbl. in 1907; an increase of 1,004,448 bbl. or 40.3 per cent. The total consumption of portland cement including both Canadian and imported cements was 3,134,338 bbl. in 1908, as compared with 3,108,723 bbl. in 1907, an increase of 0.8 per cent. The Canadian plants have a total daily capacity of 27,500 bbl. equivalent to about 8,250,000 bbl. per year of 300 days, or 10,000,000 if they were run continuously the whole year. Fifteen of the 23 plants are in Ontario, of which 12 use marl and three limestone. Of the total quantity produced in 1908 1,573,090 bbl. were made from marl and 1,922,871 bbl. from limestone and slag. The average price at the works, as returned by the manufacturers, was $1.39 per barrel. There is very little cement exported from Canada only $34,591 worth being recorded for 1908. Imports, which previous to 1904 were larger than the Canadian production, have been decreasing and were in 1908 but 14.9 per cent. of the total consumption. The total value of cement imports that year was $531,045, of which $283,899 came from the United States and $202,139 from Great Britain.

The Scotch Mineral Oil Trade

The mineral oil trade of Scotland, says the London *Economist,* has naturally suffered from the depression which exists all over the world, but, unlike most other industries, it has also benefited from that depression in respect of the lowered cost of production. The result of the depression, therefore, has not been so serious as at one time was contemplated, and, in fact, the profits of the companies increased, even though nearly all the products have fallen in value. Taking the prices ruling for the most part during the oil year just closed, in comparison with those of the previous year, the declines may be stated as ¼d. per gallon in burning oil, 3½d. per gallon in shale spirit, 2d. per gallon in motor spirit, 15s. per ton in lubricating and gas oils, 15s. per ton in sulphate of ammonia, and ¼d. per lb. in paraffin wax.

These declines do not apply to all the products sold by all the companies for the whole year, owing to the system of selling ahead and the contracts engaged early in the year. At that time prices of lubricating and gas oils and ammonia ruled higher, and at the higher prices large quantities of these were placed. These earlier sales minimized the reductions all-around at later dates, yet on the total of the sales during the year there was a considerable shrinkage compared with the previous year. On the other hand, the general depression of trade has enabled the companies to have a period of cheaper costs of production. The most important item in cost of production is labor, and shale miners' wages follow the sliding scale of the Coal Trade Conciliation Board, which made three reductions in the shale miners' wages during the year amounting to 1s. per day, bringing the average down to 6s. 3d. per day. The price of coal, too, declined, and also that of all the other materials needed in the carrying on of an oil works.

The profits and dividends, according to the companies' balance sheets just issued, including balances brought forward, we summarize as follows:

Company.	Total Profits.	Undivided.	Divided.	Dividends.
Pumpherston	£131,090	£69,840	£61,250	50%
Young's	120,500	60,071	60,429	7
Broxburn	88,880	47,924	40,956	17½
Oakbank	53,886	26,146	27,740	15
Tarbrax	21,824	9,220	12,614	15

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the five months ended May 31 are valued by the Bureau of Statistics of the Department of Commerce and Labor at $69,436,506 in 1908, and $61,202,259 in 1909; a decrease of $8,234,247, or 11.9 per cent. The leading items of export were, in long tons:

	1908.	1909.	Changes.
Pig Iron	22,737	63,455	I. 40,718
Billets, ingots & blooms	58,100	40,245	D. 17,855
Bars	22,576	27,599	I. 5,023
Rails	67,217	99,831	I. 32,614
Sheets and plates	39,997	63,771	I. 23,774
Structural steel	52,423	61,779	I. 9,356
Wire	60,223	69,324	I. 9,101
Nails and spikes	18,252	19,060	I. 808
Pipe and fittings	48,407	61,376	I. 12,969

Increases are shown in a number of items, chiefly due to heavy exports in May.

Iron and Steel Imports—Imports of iron and steel and of machinery into the United States five months ended May 31 were valued at $8,460,535 in 1908, and $10,186,093 in 1909; an increase of $1,725,558, or 20.4 per cent. Leading items of imports were, in long tons:

	1908.	1909.	Changes.
Pig Iron	37,107	48,979	I. 11,872
Scrap	1,621	2,200	I. 579
Ingots, blooms, etc.	3,878	5,269	I. 1,391
Bars	11,086	6,328	D. 4,758
Wire-rods	4,635	4,847	I. 212
Tinplates	28,341	24,174	D. 4,167
Sheets and plates	1,047	1,654	I. 607

The only considerable change was the decrease in tinplates.

Iron Ore Movement—Imports and exports of iron ore in the United States, five months ended May 31, long tons:

	1908.	1909.	Changes.
Imports	290,369	447,833	I. 157,464
Exports	40,468	83,416	I. 42,948

Of the imports this year, 291,982 tons were from Cuba.

Imports of manganese ore five months ended May 31 were 91,501 tons in 1908, and 77,642 in 1909; decrease, 13,859 tons.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

M. K. Rodgers, of Seattle, Wash., has gone to Alaska on mining business.

David C. Botting, of Black Diamond, Wash., has been reappointed State coal-mine inspector for Washington.

Adolph Lewisohn has been chosen a director of the British Columbia Copper Company in place of W. F. Crandell, resigned.

C. Christopher and W. S. Keith have left Seattle, Wash., for Los Angeles, Cal., to make arrangements for the erection of Catton oil-burning furnaces there.

J. Philip Furbeck, of Chicago, is located at Ophir, Colo., where he is engaged as assistant manager of the property of the Calumet Telluride Gold Mining Company.

William Green, for some time past mine manager of mine No. 2 of the Big Creek Coal Company at St. David, Ill., has been promoted to superintendent of all the company's mines in Fulton county.

A. K. Brewer, for several years in charge of smelter No. 2 of the American Smelting and Refining Company at Monterrey, Mexico, is reported to have resigned. He will go to California.

Frank A. Leach, director of the United States Mint, recently spent two days at Seattle, Wash., looking over the Treasury exhibit at the Alaska-Yukon-Pacific Exposition. He is now in San Francisco.

M. R. Campbell lately left Seattle for Denver, Colo., where he will remain for some time, directing the work of a number of survey parties engaged under him in the work of reclassifying the coal lands.

J. S. Diller, of the United States Geological Survey, leaves Seattle shortly for Coos Bay, Oregon, to make an inspection of coal lands in that district, which were withdrawn from location some time ago.

Richard B. Stanford, manager of the Siempre Viva mine at Cape Gracias, Nicaragua, is spending a few weeks in New Jersey. He will sail from New York about July 10, on his return to the mines.

J. Obalski, for nearly 30 years past in charge of the Mines Department of Quebec, has resigned, but will hold the position of technical adviser to the Province. He will also open an office as consulting engineer at Montreal.

R. L. Baker, who has been recently connected with the Department of Experimental Engineering of the University of Wisconsin, has entered the services of A. Bement, consulting engineer, Fisher building, Chicago.

Theodore Gross, who represents the London Venture Corporation and the Hirsch Syndicate in New York, has just gone to London in connection with some important negotiations in relation to mining property.

Dr. Reginald A. Daly, of the Institute of Technology, Boston, Mass., passed through Seattle, Wash., about the middle of June, on his way to Victoria, B. C., and thence to Hawaii, to examine the volcano Kilauea now in active eruption.

J. Vroomans, mining engineer to the government of the Dutch East Indies, has been visiting New York. He is on his way to the West where he will study the mining and milling methods at the Homestake mine in South Dakota, and also in some districts of Colorado.

Obituary

Albert Paulding Brayton, president and founder of the Pelton Water Wheel Company, of San Francisco and New York, died at his home in Oakland, Cal., June 25, aged 82 years. Mr. Brayton went to California in the early 50's and was conspicuous in the development of the industries of the Pacific coast, particularly in connection with the machine industry as applied to mining and hydroelectric development. For many years he was a member of the firm of Rankin, Brayton & Co., who operated the Pacific Iron Works, one of the pioneer concerns in the metal industry in San Francisco. He retired from this concern in 1888 and established the business of the Pelton Water Wheel Company, which under his wise and vigorous administration has since grown to be one of the most prominent concerns in the field of hydraulic power development.

Delos Van Alstyne Williams, whose death was briefly noted in a recent issue, was born in New York in 1854, and died in the California hospital, at Los Angeles, Cal., May 15, 1909, aged 56 years. His death followed an operation which was the result of a terrible experience in January, 1909, when Mr. Williams was lost for eight days in Death Valley without food or water. He was a member of the American Institute of Mining Engineers, a member of the British Club in Mexico City, and a member of the Sierra Madre Club, of Los Angeles, Cal. He was sole owner of the Sidney group of mines near Randsburg, Cal. His youth was spent in Joliet, Ill., where his body will be laid in the family burial ground. Mr. Williams was a pioneer of Leadville, Colo., and after many years spent in mining there he went to Mexico, where he remained 15 years, returning to the United States three years ago. Since then he has been very successful in his business in California. He leaves a widow and one son.

R. J. McPhee, who died at Spokane, Wash., on June 13, was born in Prince Edward island, Canada, in 1846. In the early 70's he went to California, where his first mining was done on the Comstock lode. In 1875 he took charge of the Modoc mine, Panamint, owned by Senator Stewart, of Nevada, and went thence to Bodie, Cal., where for three years he managed the Stewart properties. In 1883 he assumed the management of the Minnie Moore lead mine at Bellevue, Idaho, owned by Palmer Brothers, of London. After a year's absence from this mine he again took charge, the orebodies having meanwhile been lost, and by careful management and skilful engineering opened up what has been described as one of the richest bodies of ore ever discovered in a lead mine in the United States. The tragic death of one of the owners of this mine led to its closing indefinitely, so Mr. McPhee went to the West Kootenay district of British Columbia, where, after acting for a time as foreman of the Blue Bell mine, opposite Ainsworth, Kootenay lake, then operated by Dr. Hendryx and some Minnesota and Connecticut associates, he did some successful mining in Jackson basin, Ainsworth mining division. Later—in 1900 and 1901—he was superintendent at the Enterprise mine, Ten-mile creek, Slocan. During recent years he was manager of the Ottawa mine, Springer creek, Slocan, owned by Thomas A. Noble and A. B. Coleman, of Pittsburg, Penn., and associates, and afterward of the Reliance Gold Mining Company's May & Jennie mine, near Nelson, which was under bond to the same syndicate at the time of Mr. Noble's death. During his long connection with the industry the late Mr. McPhee was generally regarded as a capable mining man, having almost unerring judgment and good executive ability.

Societies and Technical Schools

Southwestern Interstate Coal Operators' Association—At the annual meeting at Kansas City recently the following officers were chosen: President, James Elliott, Haileyville, Okla.; vice-presidents, E. R. Sweeney, Kansas City, Mo.; John N. Hodges, Pittsburg, Kan.; William Busby, McAlester, Okla., and R. G. Rombauer, Novinger, Mo.; commissioner, W. D. Ryan, Kansas City, Mo.; secretary, J. H. Hibben, Parsons, Kan.; treasurer, W. S. Newcomb, Kansas City.

Michigan College of Mines—At a meeting the the board of control held recently at Houghton, William Kelley, of Vulcan, was re-elected chairman of the board. The resignation of Prof. L. S. Austin, head of the metallurgical and ore-dressing department, was accepted, to take effect Aug. 31, and Stuart Bruce, of Salt Lake City, Utah, was appointed as his successor. H. E. Gates, professor of chemistry, resigned, and John C. Frazee was appointed to fill this vacancy.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Salt Lake City, Goldfield, Colbalt, London

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 25—There seems no abatement in the interest being taken in the mines at Alleghany and Forest in Sierra county where such rich quartz gold discoveries have been made. Many persons visiting these, who have been in many famous camps, are greatly surprised at the showing made in the mines already opened. There are about 250 men employed as miners at Alleghany, and a much larger number are prospecting in the vicinity. Most of these prospectors are developing their own claims. There is a ready sale for anything promising and numbers of investors have sought the camps for opportunities to purchase. In the Sixteen-to-one mine, thus far the richest found, they took out $50,000 from half a ton of ore, one day this month. In fact the mine looks better than when the discovery was made, notwithstanding its phenomenal yield in a short space of time. The ore now being mined is coming from a raise 20 ft. from the tunnel, and 40 ft. from the end of it. This is at a depth of 280 ft. The tunnel of the Rainbow mine is right in the midst of a wonderfully rich pay streak.

Butte

June 24—The Federal district court has recently adjudicated the Kimberly-Montana Gold Mining Company a bankrupt. The action was brought about by Chicago creditors. The matter has been referred to the United States referee in bankruptcy at Livingston.

It is reported that the Butte Electric and Power Company of this city has recently acquired one-half of the capital stock of the Great Falls Water Power and Townsite Company, recently organized. The latter company has the contract to furnish the Amalgamated properties in Butte with electric power. Since the Butte Electric and Power Company already owns all of the capital stock of the Madison River Power Company it will now be practically in control of the electric power supply of the State.

The State railway commission recently held a hearing to consider the advisability of compelling the Chicago, Milwaukee & Puget Sound railway to connect with the Billings & Northern railway at Lavina, and to compel the Montana Central railway to connect with the Billings & Northern at Judith Gap. The shippers at the respective points maintain that these connections will make cheaper freight rates. At the hearing the railways took the position that they were entitled to manage their own affairs without interference on the part of the commission. A decision will not be rendered for several weeks.

Denver

June 26—The San Juan region is at last emerging from the effects of the severe winter, and Ouray, Telluride and Silverton are beginning to ship heavily. The output of the first named camp is headed of course by the Camp Bird, which, according to the London report, crushed in April 6684 tons of gold ore of a bullion value of $232,434, and the concentrates from this mine are keeping the teams busy between the Sneffels district and Ouray. The May shipments from this camp are given at 3000 tons, 75 per cent. of which were concentrates. The Savage Bear company, the Mickey Breen mine, an old producer, the Happy Jack, the Highland Chief and Fredonia, the Uncle Sam on Bear creek, and others are starting up again.

At Central City, the Fifty Gold Mines Company has encountered the Gregory vein in a crosscut from the Bobtail at the 1300 level, and is in fine gold ore. Marshall Draper, the manager, is sending bullion to the local bank regularly. The Egyptian group, on Quartz hill, has found both smelting and milling ore in the 250 level on the East side. The Newhouse tunnel is being slowly advanced, making about 200 ft. per month, and it is reported that the California, the workings of which are about 2200 ft. deep, will resume operations as soon as connection is made with the tunnel. Many other idle mines, including the Hidden Treasure and the Indiana, will be re-opened as soon as they are drained by this tunnel.

S. T. Lockwood, of Buffalo, N. Y., in company with Thos. F. Walsh and Dr. Victor C. Alderson, of the Colorado School of Mines, and their assistants, have been making an extended inspection of Gilpin county pitchblende and carnotite veins, with the result that it is believed that Colorado will soon be able to produce radium. Mr. Lockwood it is said has come here at the instance of Mr. Walsh, who has provided a research fund for the above purpose. The work is to be carried on at the Colorado School of Mines at Golden.

Denver people are no longer to be in the clutches of a coal combine, which hitherto has been able to charge what it chose for the lignite (or more properly, sub-bituminous) coal from the field north of the city. As high as $4.50 and $5 per ton has been the ruling price until this winter, when an independent mine broke into the market and reduced the price for a time to $3.50. The average cost of this northern coal is about $1.03 per ton f.o.b. cars, and the railroad has been charging about 4c. per ton mile for hauling it, so it will be seen that there is ample margin for a reduction, at the same time giving the producers a fair profit.

An independent firm known as the National Fuel Company, of Denver, with Harry Van Mater as president, has been formed, and with two producing mines and five others under option of purchase, this concern expects to soon have six mines in full operation. This means strenuous competition with the Northern Coal and Coke Company, which has hitherto had a monopoly of Denver business in this class of coal. With the high grade bituminous coal also now coming into Denver from the Yampa coalfield, via the Moffat road, its citizens will from now on be certain of a cheap and abundant fuel supply. The anthracite of the Yampa field is now only twenty miles distant from the Moffat road, and this coal can be laid down in Denver at an advance cost over the bituminous of not to exceed $1 per ton.

In the Cripple Creek district, an important strike is reported in the Vindicator mine at a depth of 1300 ft. The width of the orebody is given at 8 ft., and the values at $70 in gold per ton. In view of the fact that the drainage tunnel will open up a new existence for the camp, these strikes showing the presence of rich orebodies at great depth are especially important and interesting. The Dante Company will install powerful machinery at the No. 1 shaft, and develop the mine at the 700 level. The Deerhorn mine, of the Stratton estate, is shipping again, having blocked out such orebodies as will insure its producing steadily. This is the mine which was worked on the surface with scrapers, giving rise to the expression, "shipping the scenery."

Stratton's Independence dump mill has been running along steadily since starting up on the first of April, and evidently with success, as it is generally understood here in machinery circles that arrangements are under way to add the second unit of the plant this summer. The dump averaged as sampled $3.60 per ton, and the successful treatment of sulpho-telluride ores of that low grade makes a new mark in Cripple Creek ore treatment.

Indianapolis

June 22—In this State the greatest activity is shown in the Jasonville and Sullivan fields where the Queen Coal Company is operating several mines on a year's contract for the output, working every day. These mines have been working only half time, but now the company promises every day work so long as the miners load clean coal.

The Green Valley and the Bogle mines are working five days a week, and will continue to do so as long as their contracts last. The Lattas Creek, Island Valley and Northwest are working every day, and the companies say they have enough contracts to furnish their men work all summer.

The Blackhawk mine in the north part of the Jasonville field, which started to work May 1, has been working full time and is still unable to fill its contracts and a large number of orders were recently parceled out to other mines in the field. This mine employs over 300 men and is considered one of the best equipped and safest mines in the State.

With verification of the report that the Letsinger mine is to begin work July 1, and the all-summer's contract for the entire output of the Pea Fry mine, the adjoining Jasonville and Sullivan fields will be doing an encouraging and prosperous business. There are about 2000 men employed in each field, within a radius of 12 miles.

Many of the miners are buying their own homes or already own homes with garden spots, and the demand for purchasable houses on payments is so great that it is impossible to build them as fast as sold. This condition among miners is largely due to the fact that saloons have been voted out of the two counties constituting the districts.

Salt Lake City

June 25—Jesse Knight has returned from New York, where he went in connection with negotiations for the sale of the Colorado and Iron Blossom mines at Tintic and the smelter at Silver City, to the Cole-Ryan or International Smelting and Refining Company interests. The negotiations were not successful and it is now reported the matter has been taken up with the United States Smelting, Refining and Mining Company, and also with other interests. There have been persistent rumors that negotiations have been resumed looking to the consolidation of the Boston Consolidated Copper Company with the Utah Copper Company; local officials, however, deny that there is anything new in this connection.

The Western Utah Copper Company's shares were listed on the Salt Lake exchange last week. The company operates the Gold Hill mines in the Clifton section of the Deep Creek district and promises to become an important producer. W. S. McCormick is president of the company and Duncan McVichie is general manager. The company is capitalized for $2,500,000, and has 31 claims, 20 of which are patented, and owns the Redding Springs ranch of 320 acres, with water rights. The development work includes a shaft 443 ft. deep, 1500 ft. of tunnels and drifts and 1687 ft. of winzes, raises and crosscuts. A force of 18 men is employed at the mine at present and $11,218 has been spent on mine equipment.

The Seven Troughs Mining Company held its annual meeting at Provo during the week. John Dern, of Salt Lake, president of the Consolidated Mercur, was elected to the board of directors. General Manager L. A. Friedman gave his report showing that during the last year the company has been freed from debt and has a good working surplus. The mine in the Seven Troughs district in Nevada was reported to be in good condition. The option on the Nevada Hills mine at Fairview, Nev., has not been exercised by George Wingfield and associates of Goldfield. A counter proposition for a consolidation of various Fairview properties with the Nevada Hills, involved in which was an offer to put $250,000 cash in the holding company's treasury, has been rejected by the Nevada Hills company. Since the failure of the negotiations the directors of the Nevada Hills have decided to carry on an energetic campaign of development.

A 90-per cent. copper product was made last week in the experimental plant of the Fink smelter, and this demonstration was later followed by the making of blister copper in the same furnace. This was accomplished mainly on a feed of concentrates from the Boston Consolidated mill. A company to handle the new smelting furnace is to be formed in the near future.

Goldfield, Nevada

June 22—The production of the Tonopah mines for the week ending June 19 was: Tonopah Mining, 3350 tons; Belmont, 1000 tons; Montana-Tonopah, 900 tons; MacNamara, 150 tons; Midway, 100 tons; West End, 100 tons; total, 5600 tons, valued at $140,000.

Tonnage of the Goldfield district for week ending June 19 was, approximately, as follows: Consolidated, 4445 tons; Combination, 700 tons; Florence, 900 tons; Nevada Goldfield Reduction Company, 650 tons; Western Ore Purchasing Company, 900 tons; total estimated value, $279,000.

Summer tourist rates have been granted Goldfield for the Mining Congress to be held here in September. Under this schedule, tickets will be on sale September 20 to 25; the round-trip rate being from Denver, $50; Texas points, $60; St. Louis, $67.50; St. Paul, $71.25; Chicago, $72.50 and other points in proportion.

The property of the Nevada Sulphur Company, at Humboldt, Nev., was totally destroyed by fire June 15. The loss, which includes 1,000,000 lbs. of sulphur, will exceed $100,000.

At a meeting of the Johnnie Consolidated Mining Company, held in Los Angeles, June 15, A. D. Myers, president; T. A. Johnson, secretary, and Carl Anderson, superintendent, resigned their respective offices and severed their connection with the company. P. E. Mitchell succeeds Mr. Myers and also acts as general manager; C. E. Wells as treasurer, and W. E. Babcock, secretary.

At a directors' meeting of the Mayflower Mining Company held in Rhyolite, June 16, John T. Overbury tendered his resignation as secretary, being succeeded by S. R. Mason, formerly secretary of the Little Florence Mining Company, of Goldfield. A. Sydney Additon also resigned as general manager and Allan Chickering from the directorate; Mr. Additon severs all connections with the company. H. S. Stark, of Goldfield, was elected general manager and also a director. Resolutions were adopted complimenting Messrs. Overbury and Additon upon the efficient manner in which their several duties had been performed in the past. A motion was also passed stating that as the Mayflower Bullfrog Consolidated Mining Company had purchased the Mayflower Mining Company and the Starlight Mining Company, the holders of stock in the latter-named companies can, upon surrender of their certificates, receive share for share in the Consolidated Company.

Cobalt

June 25—The sale of the Gillies Limit, by the Ontario government turned out to be rather a farce. Only 283 acres were disposed of at a price amounting to $75,643. In all there were 116 tenders, but many of them were not considered as the department thought the price was too low. The nonsuccess of the sale is not much to be wondered at when the methods pursued by the government are considered. Its men had been prospecting the Limit for the last two years, and there had been absolutely no information given to the public. The short time that elapsed between the notice of the sale and the dates of its closing, also made people suspicious. Another important factor has been the failure of the Provincial mine, which lies in the center of the territory sold, to make good.

The following new companies were incorporated during the week ending June 19: The Gold Pyramid Company, Ltd., of Larder lake; capital, $1,000,000; headquarters, Ottawa. The Merida Mines, Ltd.; capital, $500,000; headquarters, Toronto. The Canadian-American Silver Mines, Ltd.; capital, $40,000; headquarters, Toronto; the Sutherland Cobalt Silver Mines, Ltd.; capital, $1,000,000; headquarters, Toronto.

Chihuahua

June 17—The Santa Eulalia mining district is about 16 miles southeast of the City of Chihuahua, Mexico. The mines now shipping are the Mina Vieja, Velardeña, San Antonio and Santo Domingo, operated and owned by the American Smelting and Refining Company. The Mina Vieja is at present shipping about 100 tons per day, but this will be quadrupled when the overhead tramway, which is now nearly completed, is in operation. The Velardeña is producing ore that runs 50 per cent. lead and from $50 to $100 silver per ton.

The Chihuahua, El Potosi, Coronel, Los Mercedes and Promontorio are owned and operated by the Chihuahua Mining Company and shipping about 5000 tons per month of silver-lead ore and 7500 tons of zinc ore to the Kansas smelters. The largest shipper of these is the Potosi. The Goldeno, Central and Juarez are operated by the San Toy Mining Company. The latter properties are now shipping about 100 tons per day.

A large body of high-grade ore has been recently developed in the Juarez. C. O. Callahan owns and operates the Santander mine as well as several others. His property is a shipper of high-grade silver ore. An English syndicate owns the Reina de Plata from which regular shipments of high-grade ore are being made.

Santa Eulalia is taking on new life, as there are said to be a number of deals being consummated on land and mining property. An English company has already purchased one property and it is reported that another has about completed a deal for four other claims. Santa Eulalia is connected with Chihuahua by two narrow-gage railroads, the Mineral and the Chihuahua Mining Company Railway. The Mineral railway operates two passenger trains daily each way and from two to three ore trains; at times it is unable to handle all the ore shipments in spite of the fact that a large amount of ore is shipped on the Chihuahua Pacific Railway. The greater part of the ore is now smelted at the Chihuahua plant of the American Smelting and Refining Company, which is about five miles east of the city; but as the plant consists of only three furnaces, its capacity is limited. It is reported that the furnace capacity is to be increased.

Water is pumped from the river near Chihuahua. At certain seasons of the year, the water question is rather a serious proposition. Tanks of water are brought from Chihuahua on the train daily and there are a number of wells which produce water, though not fit for domestic purposes, is used for stock.

London

June 23—The debenture holders of the Dunderland Iron Ore Company are now considering whether, with the help of some new process, the property can be made to pay. An enormous amount of money has been spent on this property in the northern part of Norway, and the ordinary shareholders have a very remote chance of seeing their money again. The debenture holders, who now control the property, have been seeking a suitable process, and have come to the conclusion that the dry process of magnetic separation as originally proposed, will not work. Manager Bremner has advised that the dry separation plant should be abolished and that a wet process, known as the Gröndal process, should be given a trial. Difficulties have been met with in getting a good extraction, owing to the ore consisting partly of hematite and partly of magnetite, which could not be mined separately. Under the new scheme of working it is proposed to roast the hematite ore in a furnace designed by Doctor Gröndal, of Stockholm, and thereby render it magnetic and amenable to the same wet magnetic separation treatment as the magnetite receives. It is estimated that on an annual production of 400,000 tons of concentrates, there would be a profit of £100,000 per annum.

In order to carry out this program additional capital to the extent of £500,000 is required, partly to pay the prior lien bonds and to provide a working capital of £80,000. The committee of debenture holders propose to proceed cautiously and install a plant to treat 20,000 tons of briquets per annum. As to the value of the ore deposit, there seems to be no doubt and if the process now proposed is successful, there is still hope that the debenture holders and perhaps the preference shareholders, will eventually get a return on their money.

The directors of El Oro Mining and Railway Company, Limited, have issued a report, announcing that the totad realized profit for the year ending June 30, 1909, from all sources, and including an estimate of the profit for the month of June, will amount to £207,000. Adding the amount carried forward from 1908, the disposable profit amounts to £289,530. From this sum income tax and expenditure on improvements will absorb £41,630. A dividend of £86,062 was paid last January and a further dividend of the same amount is now declared. The balance carried forward to next year's account will amount to £75,776. It is further announced that R. M. Raymond, who has been the general manager for the last six years, has resigned that position and will, in the future, act as resident managing director in Mexico. A. F. Main has been appointed to fill Mr. Raymond's place as general manager.

The Mexico Mines of El Oro, Limited, has issued a circular, announcing dividend of 7s. 6d. per share free of income tax. The total realized profit for the year ending June 30, 1909, will be, approximately, £152,143.

Paris

June 20—The report of the board of directors at the general meeting of shareholders of the Bône-Guelma railroad gives some interesting particulars on the development of the narrow-gage railroad, which runs through the principal Tunisian mining camps. The branch line from Djerissa to Slata is now in operation and ores reach La Goulette harbor. Work is progressing on the line from Kairouan to Henchir-Souatir, which will be connected with the phosphate deposits of Ain-Moularès and with the Sfax-Gafsa line which serves the important deposits of Gafsa. The standard-gage railroad system is under development in the northern part of Tunisia. Two lines starting from the iron mines of Nefzas and of Nébeur will connect at Mateur on the Tunis-Bizerte line and are under construction. They will prevent the exploitation of these large iron deposits which are under the control of the Mokta-el-Hadid company.

The Russian government is said to have abandoned its reserved right of redemption on the Sosnowice collieries. Germany will probably levy an export tax on coal. This will cause an increased output of the coal seams in Russian Poland.

The Huanchaca company, which distributed a dividend of $1 in 1907 did not declare any for the fiscal year 1908. Profits dropped from 606,269 bolivianos in 1907 to 216,927 in 1908. The directors report that this is due to the fall in prices of metals, since the output of ore increased from 70,362 tons to 97,302. However, it must be pointed out that this included mainly low-grade ores for the concentrating mill. Some profits are derived from a special reserve fund constituted in 1907 to counterbalance the fluctuations in the prices of metals.

The Société des Charbonnages de Vimy, controlled by the Forges de Chatillon-Commentry, which owns the coal concession of Fresnoy, 3180 hectares, and the Société des Recherches de Souchez controlled by the Aciéries de France, which owns the coal concession of Vimy, 1920 hectares, have made an arrangement for working their mines together. They are at the Southern end of the Pas-de-Calais coal seams. The new mines will be of great depth, and as this extension of the Pas de Calais basin is not yet well known, large financial advances will have to be made. In view of this, the two companies will join in a third one with a capital of 14,000,000 fr. As the Vimy concession is of greater value, it will be brought into the new company for a sum of 3,000,000 fr., while Fresnoy will receive 1,000,000 only. Work will be started first on the Vimy seams which may be found at a depth ranging from 750 to 1000 m., while the Fresnoy seams are over 1100 m. It will be the first attempt made to work the deep levels.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

KUSKOQUIM

A stampede has started for Kuskoquim, owing to the tales of a rich strike made there by Andrew Svenson, a former Nome miner. He and George Murphy left for Kuskoquim, while John Weatherly and Fox Ramsay have chartered a gasolene boat and left for the scene of the rich strike.

FAIRBANKS

Shipments of gold from the camps tributary to Fairbanks are expected to aggregate $12,000,000 for the season, according to reports to S. F. Rathbun, cashier of the Washington Trust Company at Seattle.

DAWSON

Surveys—Messrs. Baldwin and Craig, head engineers of the International Boundary Survey, which will run a line between Alaska and Canada from the Yukon river to the Arctic ocean, have left in small boats for the boundary. They will spend much of the season exploring Black river.

VALDEZ

La Touche—The steamship "Bertha" arrived at Seattle with 350 tons of copper ore from this and the Beatson mine. The larger part of the cargo went to Tacoma.

Arizona

COCHISE COUNTY

Junction—Sulphide orebodies have been opened in three drifts during the past week, one on the 1400-ft. level and two on the 1500-ft. level.

GILA COUNTY

Old Dominion—The estimated output for June is 3,250,000 lb. as compared with 3,088,000 lb. for May. By building a dam to bedrock in Pinal creek to divert the creek water, the flow of water in the mine has been reduced from 5,500,000 gal. to 4,000,000 gal. daily.

GRAHAM COUNTY

Arizona Copper—Cable advices from London state that the stockholders voted at Edinburgh, June 21, on a resolution to reorganize the capital by consolidating the deferred ordinary and preferred ordinary 5s. shares into ordinary shares of 5s. each, leaving the capital 150,000 A preference shares of 5s. each and 1,620,000 preferred stock and 1,580,000 ordinary shares of 5s. each. It was also proposed to give directors power to pay interim dividends.

YAVAPAI COUNTY

Big Stick—The new 20-stamp mill recently started. The mine is equipped with steam and gasolene hoists, a compressor and six drills. There is also a 2600-ft. tramway from No. 9 shaft to the mill.

California

AMADOR COUNTY

Mills—The mills of the Zeila Mining Company and the Kennedy Mining Company, at Jackson, and that of the Bunker Hill Company at Amador City, are again mining as before the recent labor troubles.

BUTTE COUNTY

Phoenix—At this quartz mine, near Hurleton, Doctor Burke, owner, rich quartz has been found, some nuggets taken out being valued at as high as $1100.

Big Blue Lead—This mine, at Magalia, N. Lambert, superintendent, has resumed operations with a full crew. A new ditch is almost completed to the company's land.

CALAVERAS COUNTY

Copper—About 50 men have been set at work at the copper mines in Campo Seco, and the full regular force will soon be employed.

Kelly Gulch—This mine, two miles from Vallecita, has been purchased by Joseph A. White, of that place.

Calico Camp—The 450-ft. incline shaft on this gravel mine, near Vallecita, has tapped a fine body of gravel. It is owned by Jos. A. White & Brothers.

EL DORADO COUNTY

Encinal Mining Company—A force of men has been set at work on this property, near Fairplay. It has been idle for some time.

INYO COUNTY

New Coss—In the Lucky Jim claim of this company, near Darwin, the shaft is run down 450 ft. The shoot will be cut in another 100 ft. An air compressor has been put into service to run three Ingersoll-Sergeant drills.

KERN COUNTY

Provident Gold Mining Company—This company, which has been operating the old Amalie gold mine, at Amalie, for the past four months, has found the lost orebody in the east drift. The capacity of the reduction plant is to be increased, the mine being now put on a profitable basis.

Yellow Aster—At the old mill a new 500-ton ore bin has been put in for this mine at Randsburg; John Singleton, president.

MODOC COUNTY

Bidwell Consolidated—At this property, near Fort Bidwell, Hoag district, they will be unable to get the new mill on the ground before Aug. 1, when the snow will have disappeared.

PLACER COUNTY

Three Stars—This mine, near Auburn, has been closed down indefinitely. It is being reopened under the supervision of A. Waltman, of Nevada City.

PLUMAS COUNTY

Tunnel—E. W. Musgrove, of Greenville, has interested capitalists in his project to run a crosscut tunnel from Dixie cañon, below Crescent hills, to Greenville. The proposed company has 25 claims under control.

SANTA CLARA COUNTY

Quicksilver Mining Company—The annual meeting in New York last week resulted in the defeat of the management and the election of an entirely new board of directors. The report for the year ended April 30, 1909, shows: Total earnings $100,594; total expenses $98,388; net profits $1206; cost of production quicksilver per flask $40.98; tons mined 29,462; tons reduced 29,955; flasks sold 2257; flasks produced 2115; price quicksilver sold $41.42; tons of ore on hand 4368; value of ore on hand $14,851; supplies consumed $21,737.

Colorado

GILPIN COUNTY

Smuggler—A strike of gold ore is reported in this mine, near Rollinsville. Manager Ashmore recently sent a $3000 bar of bullion to the Denver mint, and concentrates are also being shipped.

LAKE COUNTY—LEADVILLE

Cleveland—The fissure vein at the 690-ft. level, in the Cambrian quartzite, is now 8 ft. wide with the hanging-wall not caught. On the footwall there are 3 ft. of solid mineral, then comes 4 ft. of low-

grade ore and a 6-in. streak that runs better than $40 per ton. Development is slow on account of the loose nature of the ground and the heavy flow of water.

Valley Shaft—A new electric plant has just been installed at this property in South Evans gulch. The next important move will be the sinking of the shaft to greater depth. The shaft is now 320 ft. deep. Sulphide ore is being shipped from this level and oxide ore from the upper level, the daily output being 50 tons.

Coronado—In addition to working this property the lessees are also working the Hibschle from the Coronado and shipping 50 tons daily of a good grade of iron ore.

Carbonate Hill—The Morning Star is shipping regularly and the Yankee Doodle is sending out daily a carload of good ore. The lessees on the Waterloo are also shipping regularly.

Sunday Tunnel—Development work is being pushed on the vein to the south on the tunnel level; at the 570-ft. level the vein of copper ore is being worked; the daily shipments from the property are 50 tons, averaging $20 per ton.

Buckeye Gulch—The Hope Mining and Milling Company is doing the most extensive work in this section, driving three tunnels to cut the 17 claims on Gold hill. One tunnel is in 100 ft., and another 50 ft. should reach the solid formation. The other tunnels have been only recently started.

Dinero Tunnel—Regular shipments of ore are now being sent from this Sugar Loaf property, and development work is being pushed. The owners of the Virginius are developing their claim from the Dinero tunnel and expect to reach the vein by the end of the month. Considerable work will be carried on in this section during the summer.

Yak Tunnel—This company has decided to lease out some of its territory and the first to be placed on the market will be the Belgian-Frenchmen group of claims on Iron hill. The breast of the tunnel is now alongside of the New Monarch shaft, and by the first of the month it is understood that a 1000-ft. lateral will be driven to this property. When completed the New Monarch will sink and connect with the tunnel level.

OURAY COUNTY

Camp Bird—Report for May: Mill ran 30 days, and crushed 6620 tons of ore, yielding 15,516 oz. of bullion and 690 tons of concentrates. Amount realized from sale of bullion, $252,062; from 303 tons of concentrates, $26,890; less expenses, $52,480. Profit, $225,064. Development work, 789 ft. The directors have authorized W. J. Coxe, general manager, and R. J. Frecheville, director, to examine an important operating mine in Mexico with the view of purchasing it for the Camp Bird.

SAN JUAN COUNTY

Arpad—The mine and mill are being put in shape for permanent operation. Five new power drills have been installed.

Esmeralda—The work of unwatering the shaft has been begun on behalf of the New York purchasers of this property. The driving of a tunnel and erection of a cyanide plant is under contemplation.

TELLER COUNTY—CRIPPLE CREEK

Delmonico—The Consolidated Copper Creek Company, operating this Bull Hill mine, has installed a 100-h.p. boiler preparatory to using machine drills. Two to three cars per week are being shipped, but the tonnage will soon be increased from recently developed orebodies. Lessees operating on the north block of the Delmonico are also obtaining a fair grade of ore.

North Star—On Raven Hill, Hassell, Bradley & Mahoney, operating one of the eastern blocks, have encountered a 3½-ft. vein.

Lucky Gus No. 2—Moore & Seeley, of Victor, leasing on this Stratton Estate property, on Bull hill, have shipped a car of coarse rock and one of screenings from the oreshoot under development.

Deep Drainage Tunnel—On June 21 a blast in the south heading of the intermediate shaft of the Roosevelt deep drainage tunnel broke through into the portal heading and connected the two workings. The alinement and grade of the two bores had been carefully maintained by both crews. The total distance covered in the two headings is 7975 ft. In addition the north heading from the intermediate shaft has been driven 1875 ft., making a total distance of 9850 ft. Work was begun on this tunnel in May, 1907.

Florida

ALACHUA COUNTY

Two more of the phosphate mines have been closed down on account of the low prices now being obtained for the rock in the markets. The Central Phosphate Company decided upon this move after operating during the dull season for the past year or more. This leaves only a very few of the mines now being run, such as Dutton, Cummer, Williams and a very few others of the independent companies.

Idaho

SHOSHONE COUNTY

Snowstorm—Manager Greenough states that the May shipments amounted to 10,000 tons of ore, and he estimates the June output as 13,500 tons. The ore is shipped to the Garfield smelter, Salt Lake City, and the Balaklala smelter, Coram, Cal. One hundred and twenty-five men are employed at the mine.

Illinois

LA SALLE CONTY

Acme Coal Company—The decision to close the mine at Streator has been reconsidered, and work will be continued.

VERMILION COUNTY

Preparations are being made to start work again on the Deering and Kelly mines at Westville, which are now under lease to the Brazil Block Coal Company.

WILLIAMSON COUNTY

Spillertown Coal and Coke Company—This company is opening a new mine on lands recently bought near Spillertown. The coal is said to be a good gas coal.

Indiana

CLAY COUNTY

A company is being organized by George Pell and other coal men of Brazil, for the purpose of sinking a shaft on Pell's land, east of the city. This shaft will be sunk 100 ft. below the first vein, which has long been worked in this district. A second vein of coal is known to exist under this land.

Coincident with the beginning of a damage suit for $20,000 by a miner against the Miami Coal Company for injuries sustained by a fall of slate in mine No. 3 in 1907, a heavy fall of slate in Mine No. 1 occurred June 23, burying two miners and injuring both.

SULLIVAN COUNTY

The Bellevue Coal Company, of Sullivan, which operates the Bellevue mine in Haden township, has settled its financial difficulties by floating a loan of $25,000 and will pay off the miners' liens against it. The mine will resume operation.

Representatives of Chicago capitalists are endeavoring to obtain options on 10,000 acres of coal land in Hamilton and Turman townships.

VIGO COUNTY

The mine workers' officials had a controversy with the Vandalia Coal Mining Company over the top-coal question during the past week. The men say they should be permitted to remove the coal at the top in order that they may earn fair wages, but the company insists it is not safe to do so and that the mine inspector has ordered that it not be removed.

VERMILION COUNTY

The cage in Klondike Mine No. 4, near Clinton, became unmanageable and dropped from the pit opening to the bottom of the shaft, a distance of 315 ft. Twelve miners were in the cage, all of whom were injured seriously, some fatally. The accident is being investigated.

Michigan

COPPER

Winona—Work has begun for the foundations of the new stamp mill which is to be erected jointly by this and the King Phillips Company.

Ojibway—No. 2 shaft has reached the

950-ft. level and is cutting a station preparatory to crosscutting to open the Kearsarge lode. No. 1 shaft will open the formation before No. 2 shaft.

Mass—The new lode that was first opened by means of a crosscut from the 17th level of "A" shaft has been exposed at two points at the 13th and 15th levels. Another mill test is to be made as soon as some adjustments can be made at the mill in view of eliminating the large loss in the tailings. The rock is to be sorted, and barren ground will not be stamped as in the case of the first test when the full face of the formation was taken.

Michigan—A drill core, well charged with copper, was taken from the drill hole at a depth of about 90 ft, that is going down on the hanging wall side of the Evergreen lode. As the estimated distance to this lode is much greater than this, the identity of this strike is as yet undetermined.

Superior—This company is shipping about 100 tons of rock daily to the Atlantic mill. The average production of refined copper per ton of rock handled since the beginning of the mill run has been 22 pounds.

Missouri

JOPLIN-ZINC-LEAD DISTRICT

Don McRuer—This company at Spring City has purchased the Delta mill and is moving it to the lease where the Alladin mill burned. Rich ore has been found in drilling and also in the old Alladin shaft No. 8.

Charter Oak—The 40-acre lease on this ground at Carterville has been taken by Mr. Goodlet, of Kansas City, and will be developed.

Missouri Hills—Bud M. Robinson, of Joplin, recently organized this company with a capital stock of $100,000.

Nowata—W. U. Squires, Joplin, manager, has about completed the mill on the Luke land near the Gibson mine at Porto Rico.

Neck City—Two new mills are nearly completed in this camp and will soon be producing.

Belle Center—Drilling is being done for sheet ore west of Joplin and rich strikes have been made. The Louisville Zinc and Lead Company and Sampson Mining Company have nearly completed their mills.

Mattes Brothers—While drilling virgin ground near the head of Gordon hollow 14 ft. of rich sheet ore was encountered.

M. I. & O.—This old mill near Jackson hollow has resumed operations.

Old Dominion—The mill in Gordon hollow southwest of Joplin is about completed.

Emperor—The mine has resumed operations in Gordon hollow.

Cambria—The 250-ton mill and 40-acre lease in the sheet-ground district west of Joplin has been sold and the new company will take hold at once.

Montana

CHOUTEAU COUNTY

August—It is reported that Philips & Witcomb, owners, have leased and bonded the mine to a syndicate, represented by John Edgerton, of Helena, for the sum of $3,000,000. The mine is in the Little Rockies district near Zortman. It is stated 35 men are now employed in the mine.

DEER LODGE COUNTY

High Grade—The property is in the Blue Eyed Nellie district about 10 miles from Anaconda, and is being worked through a shaft now down 120 ft. Some rich carbonate ore has recently been discovered. Sigurd Renblom is in charge of operations which at present consist of installing machinery preparatory to sinking to the 400-ft. level.

JEFFERSON COUNTY

Boston & Corbin—Raising in the three-compartment air shaft has been finished, and the new 14-drill air compressor has arrived on the property. Work is being pushed on the 700-ft. level.

Calumet-Corbin—A new two-compartment shaft has been completed and development work is now being carried on at the 200-ft. level. The company employs 85 men at the property.

MADISON COUNTY

Pioneer Gold—At the company's property, in the Big Hole basin, a 30-ton Chilean mill will be installed, for which power will be furnished by a 12-h.p. gasolene engine. W. H. Rideout is in charge of operations.

New Mine—This property is in the Rochester district and has recently been optioned to E. M. Hand. It is reported that gold ore running from $200 to $300 per ton has been discovered.

Nevada

ESMERALDA COUNTY—GOLDFIELD

St. Ives—A 12-ton shipment of ore will be sent out this week. The bulk of the ore, it is estimated, will run from $150 to $200 per ton.

Florence Goldfield—Connection will be made this week between the bottom of the main shaft, now 320 ft. deep, and the raise from the crosscut on the 500-ft. level of the old Engineer's lease. The old and new shafts will be enlarged to three compartments. May production was 3350 tons which produced $33,500 in bullion.

Red Top Consolidated—This property has closed down and the lease has been surrendered to the Consolidated Company.

ESMERALDA COUNTY—GOLD MOUNTAIN

Goldfield-Granite Mountain—George Mayer, superintendent, reports that the crosscut tunnel, now in 700 ft., should cut the ledge within the next 20 ft., where a depth of 400 ft. will be obtained. The ledge shows from 30 to 40 ft. in width on the surface and carries a 10-ft. vein of ore from which assays range from $10 to $40 per ton.

ESMERALDA COUNTY—HORNSILVER

Great Western—It is generally admitted that this property has recently changed hands. No details concerning the transaction are to be had. The property has shipped 1254 tons of ore to date, having a total value of $119,557 and has a large quantity of shipping ore still blocked out. In addition to this there is a large amount of milling ore in reserve.

ESMERALDA COUNTY—LUCKY BOY

MacCormack—A strike was made in this property last week, 7 ft. of ore being disclosed while cutting a station at the 110-ft. level. A shipment of 25 tons was made on June 17. The property is equipped with a 25-h.p. hoist and a compressor plant is to be installed during the summer.

ESMERALDA COUNTY—LUNNING

Joseph L. Giroux, of Ely, is now excavating ground for a 75-h.p. hoist on his property near Lunning.

Old Dunlap—It is reported that this mine 12 miles east of Sodaville, has been financed again. The mine now has a long tunnel that is to drain all the workings. This tunnel is to be cleaned out and the mine opened.

ESMERALDA COUNTY—MONTEZUMA

Gold King—J. A. Burton, of Anderson, Indiana, stopped in Goldfield last week *en route* to the company's property at Montezuma, and stated that work was to be resumed. Mr. Burton will have charge of the mine.

ESMERALDA COUNTY—RAWHIDE

Grutt Balloon Hill—A 30-ton shipment of ore was made last week, having an average value of about $200 per ton.

Marigold—This lease, on the Coalition estate, has a 30-ton shipment of high-grade ore in transit. The management has leased the Knight Conlon mill and will treat its low-grade milling ore on company account in the future.

Gordon Coalition—A 16-in. vein of gold ore has been encountered on the 150-ft. level.

Rawhide Western Railway—It is reported that the road has passed into the hands of a large bank in San Francisco. There are many signers to the articles of incorporation to pay in large sums of money and the bank may force these collections.

Salt Lake-Rawhide—This new incorporation is now operating three claims and sinking a shaft.

King-Heisner—The mill is expected to be in operation by August 1. The delay in starting has been on account of not receiving the material and supplies on time.

HUMBOLDT COUNTY—NATIONAL

Combination—A shipment of eight sacks of ore, valued at $30,000, was made last week. The ore came from the face of the tunnel which has been driven on the ledge a distance of 350 feet.

New Mexico

GRANT COUNTY

Chemung Copper—The directors have called an assessment of $1 per share on the company's 200,000 shares, making the stock $9 paid. The mine is opened down to the 800-ft. level, and to date 32,000 ft. of openings have been made underground. The mine has recently cut into new orebodies which will average between 3 and 4 per cent. copper. A survey for a railroad to the mine is being completed.

SOCORRO COUNTY

Mogollon Gold and Copper—Robert Brownell, of Nova Scotia, is reported as having bought this property in the Cooney district. Operations are to begin in the near future.

Oklahoma

OTTAWA COUNTY

Ottawa—Prospecting with drills is being carried on at this property, near Miami. F. H. Knoche, of Kansas City, is president; J. P. McNaughton, of Miami, vice-president. Capital stock, $100,000.

Pennsylvania

BITUMINOUS COAL

James E. Roderick, chief of the State Bureau of Mines, has made the appointments of inspectors to the districts in the bituminous field. There are 21 in all, one new district having been made. The names include some reappointments and some transfers. Under the new law all had to pass an examination. The names of the inspectors and their headquarters are: First district, Alex. McCanch, Monongahela; second, C. B. Ross, Greensburg; third, T. K. Adams, Mercer; fourth, Elias Phillips, DuBois; fifth, Isaac G. Roby, Uniontown; sixth, T. D. Williams, Johnstown; seventh, Arthur Neale, Crafton; eighth, Joseph Knepper, Phillipsburg; ninth, T. J. Walsh, Connellsville; tenth, Joseph Williams, Altoona; eleventh Daniel Blower, Scottdale; twelfth, Roger Hampson, Punxsutawney; thirteenth, John T. Bell, Dravosburg; fourteenth, David Young, Freeport; fifteenth, Alex Monteith, Patton; sixteenth William Howarth, Brownsville; seventeenth, John I. Pratt, Pittsburg; eighteenth, Thomas Lowther, Tyrone; nineteenth, Charles T. McGreegor, Irwin; twentieth, Nicholas Evans, Somerset; twenty-first, F. W. Cunningham, California.

Tennessee

MARION COUNTY

Tennessee River Coal Company—This company has been incorporated for the purpose of developing 5000 acres of coal land to which it has secured title. It purposes opening a mine which will have a daily output of 2000 tons. The work is to be directed by Crozier F. Kilpatrick, engineer-in-charge, whose office is at 33 Wall street, New York.

Utah

BEAVER COUNTY

King David—Both the King David and Indian Queen properties have arrived at an interesting stage of development with definite results in the opening of orebodies likely to appear at any time. The drift sent northward from the King David shaft to cut the Horn Silver contact vein has been driven 170 ft. and mineralized ground has been encountered. The drift on the 300-ft. level is also in a favorable formation. David Evans, manager, Beaver, Utah.

Horn Silver—The old Horn Silver mine is now shipping a car of ore per day and much prospecting is being done in the mine. A force of 70 men is now employed.

BOX ELDER COUNTY

Homber—An extensive bed of graphite has been discovered on the property in Box Elder county. A. G. Burritt, manager, Perry, Utah.

JUAB COUNTY

East Tintic Development—A carload of high-grade ore was shipped from this property last week, and two more cars are to go forward before the end of the month. The ore is being taken from the 230-ft. level. Ralph Kellogg, Eureka, Utah, is manager.

Zuma—The shaft being sunk on this property is in the limestone, and on reaching the 200-ft. level a drift will be started northward to catch the outcrop near the Iron King property. John Endlund, superintendent, Eureka, Utah.

Tintic Production—The output of the mines, during the last week, follows: In 50-ton cars, Sioux Consolidated, 14; Mammouth, 5; Centennial Eureka, 46; May Day, 2; Eureka Hill, 1; Eagle & Blue Bell, 1; East Tintic Development, 1; Uncle Sam, 4; Grand Central, 5; Victoria, 4; Carisa, 1; 20-ton cars, Beck Tunnel, 3; Colorado, 25; Dragon Iron, 33; Iron Blossom, 20; Swansea, 4.

West Virginia

MARION COUNTY

Jamison Coal and Coke Company—This company, which has its main office in the Frick building annex, Pittsburg, has purchased 6800 acres of coal land on the Pittsburg vein, near Barrackville, from the Barrackville Coal and Coke Company and the Philadelphia & Reading Coal and Iron Company. The purchaser intends to develop and will sink two shafts for a large output as soon as engineers can prepare plans. It has also acquired surface lands for four or five plants.

Wyoming

BIG HORN COUNTY

Frannie-Garland Oilfield—Quite an interest is being manifested in this district with reference to the possibilities of developing oil in paying quantities. The oil sands are 16 to 20 ft. thick and the field extends north into Montana. The Montana-Wyoming Oil Company has drilled three wells, which are producing from 300 to 500 bbl. per day. A refinery is being built at Cowley. Oil men from Oklahoma, California, and the East are becoming active in the district.

Canada

ALBERTA—BLAIRMORE DISTRICT

Head Syndicate, Ltd.—This company has been organized in London to acquire and develop the Head & Martin coal lands, situated a few miles from Blairmore in southwest Alberta. The lands run for practically eight miles on the coal measures, overlapping for two miles those of the International Coal and Coke Company, which during the last five years has developed its property into a productive coal mine. There are known to occur on the Head & Martin property five workable seams of coal, the biggest of which is 43 ft. 6 in. thick, there being first 24 ft. 8 in. of clean coal, then 13 ft. in which there is some shale, and then 5 ft. 6 in. more of clean coal. This seam has been opened about two miles south of the International Company's southern boundary line, and, where cut by a 60-ft. tunnel through solid rock, is undisturbed, and has the mountain rising 700 ft. above it. Leslie Hill, Nelson, B. C., is manager.

BRITISH COLUMBIA—NELSON DIVISION

Nugget Gold Mines, Ltd.—Last shipment of bullion was valued at $6585, being for 439 oz. recovered from plates of a four-stamp prospecting mill during run of three weeks. Since work was commenced about 18 months ago there have been shipped to the smelter 530 tons of crude ore of an average value of $116.50 per ton; 2750 tons of second-grade ore, averaging about $17 per ton, have been milled.

Queen Mining and Milling Company—The 20-stamp mill at the Queen mine, Salmo, is crushing an average of 65 tons of ore per day, running generally between $12 and $14, with some as high as $28 per ton. Most of the gold is recovered by amalgamation. W. B. Dewitt, Salmo, is superintending operations.

BRITISH COLUMBIA—SLOCAN

Van Roi Mining Company—Shipment of concentrates has been resumed. Smelter returns from seven cars, total dry weight 272,527 lb., are $11,027.31, after payment of freight and treatment charges. This gives an average of about $81 per ton. Concentration—about 7 into 1—is effected at the Wakefield mill, near Silverton, Slocan, leased by this company.

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt for the week ended June 12 were: Buffalo, 49,300 lb.; Crown Reserve, 60,390; Chambers-Ferland, 60,000; City of Cobalt, 53,000; Drummond, 200,000; Kerr Lake, 58,900; La Rose, 65,000; McKinley-Darragh, 58,500; Nipissing, 320,150; Right-of Way, 85,729; total, 1,010,969 pounds.

Shipments of ore from Cobalt for the week ended June 19 were: Buffalo, 46,900 lb.; City of Cobalt, 65,000; Cobalt Central, 55,000; Coniagas, 61,700; Crown Reserve, 223,413; La Rose, 195,691; McKinley-Darragh, 59,362; Nipissing, 397,688; Temiskaming, 52,800; Temiskaming & Hudson Bay, 60,400; total, 1,217,954 pounds.

British-American—This mine, below the Gilles Limit, is putting in a small steam plant.

Gifford Extension—Arrangements have now been completed with the Ophir mine to purchase air. The pipe line is being laid. The main shaft, down 86 ft., is to be continued to the 200-ft. level. A small boiler and hoist will shortly be installed.

John Black—A small compressor and an 80-h.p. boiler has been ordered. New buildings will also be erected to meet the growing needs of the mine.

O'Brien—The No. 3 vein of the La Rose has been encountered. The vein has a width of about 7 in. The mine will shortly double the output of the high-grade ore. Arrangements are also being made to double the output of the Thorald plant, which is also under the control of M. J. O'Brien.

Badger—A vein of good ore, about 5 in wide, has been encountered.

Kerr Lake—A new vein 17 in. in width has been found. It is claimed to be better than the Crown Reserve vein.

Cobalt Lake—One of the shaft houses of this company was destroyed by fire on June 21.

Coniagas—During the summer the capacity of the mill will be doubled. The new machinery will consist of 30 stamps, 1250 lb. each, and the necessary tables. An extension will be built to the east of the present mill to house the addition. No changes will be necessary in the crushing and jigging end.

Eastern Townships—A 30-h.p. boiler and 6x8 hoist are being installed, and it is expected that they will be running in June.

Empire Mines—At their meeting June 14 the directors decided to sink the shaft from the 125-ft. to the 200-ft. level. A new compressor will be purchased.

La Rose Consolidated—A quarterly dividend of 3 per cent. with bonus of 1 per cent. has been declared. A financial statement covering the first fiscal year of the merger, ending May 31, has been issued, showing total production of ore, 6164 tons; of silver, 3,010,831 oz., net value at mine, $1,364,372. Operating and marketing expenses were $481,925, and the net operating profit $1,093,572. On construction account $23,574 was expended. It costs the management about 16c. per oz. to recover silver and develop the several properties, leaving about 35c. per oz. profit.

Little Nipissing—It is expected that a shipment will shortly be made from the Peterson Lake lease, as there is almost a carload of ore already bagged.

Silver Cliff—This mine has been sold to Pittsburg capitalists. Captain Jeffrys, formerly of the Chambers-Ferland, mill assume the management.

Temiskaming—At a meeting held in Haileybury, June 12, the directors decided to pay no dividend for the current quarter. In a statement issued to the shareholders they say that they think it advisable to build up a large cash reserve. Up to date no revenue has been obtained from low-grade ores, of which the company has at a conservative valuation $500,000 worth on the dumps, while 100 tons per day of concentrating ore of an average value of $15 per ton are being produced. A concentrating plant is to be installed with a capacity of from 75 to 100 tons daily at an estimated cost of over $75,000. This is expected to be in operation before the end of the year and should add at least $400,000 yearly to the net revenue.

ONTARIO—ELK LAKE DISTRICT

Elk Lake Discovery—The shaft is now the deepest in the district, being down 154 ft. Drifting has been commenced at the Bottom toward No. 4 vein.

Mother Lode—Work has been commenced on a shaft which will be put down 150 ft. to catch a vein believed to carry silver.

ONTARIO—MONTREAL RIVER DISTRICT

Otisse—The first of the mine veins to be opened up at the 75-ft. level has been reached by the crosscut. The whole ore-body is over 30 in. wide and consists of a calcite vein 6 in. wide carrying smaltite and native silver, 2 ft. of fissure filling interspersed with leaf silver making good milling ore and a calcite band rich in silver.

ONTARIO—STURGEON LAKE

St. Anthony—This mine, the pioneer gold mine of the district, which has not been worked for 18 months, is being pumped out by the owners, Colonel Ray and A. L. McEwen, of Port Arthur, for inspection by the representatives of a Boston company, which has an option on it.

Mexico

DURANGO

Mexico Consolidated—From Dec. 1 to June 1, there were mined and milled 379 tons of high-grade ore and 4213 tons of mill ore. From this ore $104,333 have been realized, and from custom ore $80,990, or a total of $187,232. The cost of operations has been reduced from $12.25 to $7.25 per ton. President Stallforth states that the net ore reserves Jan. 1 were $372,000, and that on June 1 they were $850,000. Total liabilities $210,000.

GUANAJUATO

Guanajuato Consolidated—Production for May: Bullion, $65,250; concentrates, $51,250; working expenses, $53,100; estimated profits, 43,400 pesos. Of this amount 9400 pesos have been expended on development account. The mill ran 30½ days and crushed 7383 tons of dry ore. The amount of development done was 231 feet.

MEXCO

Esperanza—Report for May: Mill ran 22 days; crushed 11,118 tons of ore; estimated profit for the month, $34,928. New development work aggregated 325 feet.

Africa

TRANSVAAL

The labor return from the mines shows that on May 31 there were 158,279 Kafirs 7717 Chinese employed. This is a decrease during May of 17 Chinese and of 4622 Kafirs—the first decrease in Kafir labor shown for two years.

Production other than gold for the three months ended March 31 was: Silver, 196,882 oz., an increase of 14,069 oz. over last year; copper ore 515 tons, an increase of 336 tons; tin ore, 443 tons, an increase of 167 tons; galena, 512 tons, a decrease of 187 tons.

WEST AFRICA

Gold output in May is reported at 25,104 oz. bullion, being 3613 oz. more than in April. For the five months ended May 31 the total was 126,259 oz. bullion in 1908, and 114,001 oz. in 1909; a decrease of 12,258 oz. The bullion reported this year was equal to $2,233,824, or 108,171 oz. fine gold.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, June 30—The coal trade in the West shows a continuance of about the same conditions as were reported last week. Business in steam coal at most of the principal centers is improving; but at the same time any increase in prices has been prevented by the tendency of shippers to hurry coal to market in quantities exceeding the demand. This results in some forced sales to avoid demurrage, which keeps down prices.

The bituminous trade in the East begins to show an improving demand, and business is better than for some time, especially in the manufacturing cities where mills and other establishments consuming coal are showing a disposition to take on supplies.

The anthracite trade is quiet and steady. The heavy stocks which were accumulated last April have been worked off for the most part and the collieries are running more evenly, though work is not being pressed.

The coke trade shows the greatest improvement. The railroads serving the Connellsville region report large increases in tonnage over last year, and the production reports from the region have shown a gain each week for some time.

Coal Rate Troubles—A petition has been filed with the Ohio Railroad Commission by operators on the Pittsburg vein in that State, who claim that rates charged by the Wheeling & Lake Erie road to Cleveland and Huron—85c. per ton with 5c. extra for terminal charges—are unreasonable. A hearing has been had, but no decision rendered.

The Interstate Commerce Commission has refused the petition of a number of coal operators in Colorado for a revision of the rates on coal from the Walsenburg field in southern Colorado. The commission holds that rates are not unreasonable and must stand.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to June 19, short tons:

	1908.	1909.	Changes.
Anthracite	2,578,880	2,424,321	D. 151,559
Bituminous	15,069,890	16,357,501	I. 1,287,611
Coke	3,177,490	4,649,487	I. 1,471,997
Total	20,823,260	23,431,309	I. 2,608,049

Total increase this year to date was 12.5 per cent.

Coal receipts at Boston, five months ended May 31, reported by Chamber of Commerce:

	1908.	1909.	Changes
Anthracite	731,598	718,818	D. 12,780
Bituminous	1,350,691	1,261,517	D. 89,174
Total domestic	2,082,289	1,980,335	D. 101,954
Foreign	119,435	196,600	I. 77,165
Total	2,201,724	2,176,935	D. 24,789

Total decrease this year, 1.1 per cent. The foreign coal is chiefly from Nova Scotia.

Coal shipments of Monongahela River Consolidated Company, half-year ended April 30, short tons:

	1908.	1909.	Changes.
River shipments	2,578,674	2,529,439	D. 49,236
Rail shipments	675,381	339,695	D. 335,686
Total	3,254,055	2,869,134	D. 384,921

The total decrease this year was 11.8 per cent.

New York

Anthracite

June 30—The market is quiet, business in fact being rather dull. There was a little spurt of orders to save the June discount, but it did not amount to much. In fact matters have settled down into the usual hot-weather dullness.

With tomorrow—July 1—the 10c. comes off the discount and list prices will be $4.55 per lump, and $4.80 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are $3.10@3.25 for pea; $2.35@2.50 for buckwheat; $1.70@2 for buckwheat No. 2, or rice, and $1.25@1.50 for barley, f.o.b. New York harbor points. Some individual and washery pea and buckwheat have been offered at 10 or 15c. less.

Bituminous

Trade has been a little better. The far East seems to be waking up to the fact that it needs coal, while trade along the Sound has been better. New York harbor also is buying some coal, but there has been no advance in prices. Fair grades of steam coal can be had at $2.40@2.50, f.o.b. harbor points, with $2.60 up asked for better grades.

All-rail trade is in fair shape, better in fact than the Coastwise business. Car supply is good, but transportation is a little irregular.

In the Coastwise trade vessels are in good supply and rates are the same as they have been for some time. From New York cargoes are taken at 60@65c. to points around Cape Cod, and 45c. to Providence and the Sound.

Birmingham

June 28—More coal is being mined now in Alabama than has been reported in several months and indications point to a sharp demand for labor before the end of the summer. Much of the coal-mine labor has left the State or gone into other lines. Contracts for fall delivery are beginning to come. Dr. G. B. Crowe and associates have purchased several thousand acres of coal lands in the lower part of Jefferson and in Shelby county and are beginning operations on a large scale. The Louisville & Nashville railroad will build a track to the properties and three entries to the coal are to be made.

Chicago

June 29—The coal market continues quiet, with steam coals generally in fair demand and the market strengthening somewhat by reason of the beginning of the harvesting trade, which is already demanding heavy supplies. Fine coals are strong; lump is weak, as regards the great bulk of the trade, that in western bituminous. Eastern coals are in general languid; the market for them is steady, but prices are kept up only by rigid restriction of shipments and this it is difficult to maintain. Domestic coals in general are very weak, no retailers caring to lay in any considerable supplies, even of anthracite.

Illinois and Indiana lump brings $1.75@2.15; run-of-mine, $1.60@1.75 and screenings, $1.50@1.70. The lessening of output from the mines of these States has done much to keep the market steady, but must be continued to be of effect for any considerable time.

Smokeless is somewhat stronger as a result of general restriction of supplies following the depression in prices of the last few weeks. The result will be temporary unless this restriction is continued, for shipments of smokeless have been in flood waves. Lump and egg from Pocahontas and New River mines brings $3.05@3.30; other smokeless lump, $2.95@3.20; run-of-mine smokeless is on the market at $3.05 for Pocahontas and $2.95 for lower grades. Hocking coal is somewhat overplentiful at $2.90@3.15; Pittsburg No. 8 is plentiful at $2.65 for ¾-in. lump, and Youghiogheny is a light seller at $3 for ¾-in. lump.

Cleveland

June 29—Demand is steadily improving for steam coal, especially for slack. The quotations for Middle district coal are:

Lump, $1.85@2; run-of-mine, $1.65@1.75; slack, $1.25@1.35. For No. 8 district lump, $1.90@2.05; run-of-mine, $1.70@1.80; slack, $1.40, all f.o.b. Cleveland.

Lake shipments are steady, and there is little trouble about boats.

Indianapolis

June 29—There has been no special incident in the coal market during the week. There is a continued improvement in the demand for steam coal.

The Indiana Coal Operators' Association, with headquarters in Terre Haute, has asked State Mine Inspector Epperson for a conference in regard to the alleged variance in the rulings of deputies at mines when complaint is made of dangerous places. The operators say that in some instances one inspector will accept conditions and soon after another deputy will order a mine closed until changes have been made.

Pittsburg

June 29—Coal shipments up the Lakes continue light, but will be considerably heavier after July 4. There is quite an accumulation of coal at the docks and railroad shipments are not likely to increase materially. The market continues quiet and not overstrong, as consumption is rather light, so many manufacturers using slack where formerly mine-run was used. Nominal prices remain at $1.10 to manufacturers and $1.20 to retail dealers for mine-run, but these prices are shaded 5 or 10c. Slack is firm at 60@65 cents.

Connellsville Coke—The market continues dull, with only occasional transactions involved in the starting of additional blast furnaces. The market has certainly shown remarkable apathy to the efforts which are being made to consolidate most of the independent producers. The appraisement in connection with the merger is about completed, but no additional information has come out. The market remains quotable at $1.55@1.60 for prompt and $1.65@1.75 on contract for Connellsville furnace coke, and $1.80@2 for prompt and $1.90@2.25 on contract for Connellsville foundry coke.

The *Courier* reports production in the Connellsville region in the week ending June 19 at 307,014 tons, an increase of 8000 tons in a week. Shipments are reported at 4361 cars to Pittsburg, 6165 cars to points west of Pittsburg and 887 cars to points east of Connellsville, a total of 11,413 cars, this being a gain of 300 cars in a week.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, with coal bunkered or sold to steamships in foreign trade, five months ended May 31, long tons:

	1908.	1909.	Changes.
Anthracite	1,047,427	1,097,588	I. 50,161
Bituminous	3,033,308	2,860,568	D. 172,740
Total exports	4,080,735	3,958,156	D. 122,579
Bunker coal	2,482,240	2,447,412	D. 34,828
Total	6,562,975	6,405,568	D. 157,407
Coke	296,893	405,270	I. 108,377

Canada took this year 2,999,512 tons of coal, or 75.8 per cent. of the total. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, five months ended May 31, long tons:

	1908.	1909.	Changes.
Anthracite	15,023	3,115	D. 11,908
Bituminous	706,381	454,113	D. 252,268
Total coal	721,404	457,228	D. 264,176
Coke	52,181	76,644	I. 24,463

Canada sent this year 396,483 tons of coal and nearly all the coke; Australia, 44,048 tons of coal. Imports are chiefly on the Pacific coast and on the northern border, into Montana and Washington.

Nova Scotia Coal Shipments—Shipments of coal from Nova Scotia mines, five months ended May 31, long tons:

Companies.	1908.	1909.	Changes
Dominion	1,122,516	825,746	D. 296,770
Nova Scotia Steel	224,505	178,556	D. 44,949
Cumberland	169,238	152,515	D. 16,723
Acadia	131,904	100,393	D. 31,511
Inverness	98,120	73,115	D. 25,005
Intercolonial	112,678	92,294	D. 20,384
Total	1,857,961	1,422,619	D. 435,342

The total decrease this year was 23.4 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on June 19: Best Welsh steam, $4.26@4.32; seconds, $4.08; thirds, $3.96; dry coals, $4.14; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.70; second, $2.58. All per long ton, f.o.b. shipping port. There has been another advance in Cardiff coals.

Iron Trade Review

New York, June 30—While conditions in the iron and steel markets continue good, something of the usual quiet of midsummer begins to settle down, as might naturally be expected. This does not alter the fact, however, that the degree of business activity prevailing is very encouraging.

The pig-iron market shows orders more freely placed than for some time. In the Central West business has been rather quieter, though prices remain firm. In Seaboard, and especially in New England territory, inquiries are coming freely from manufacturers and it is to be noticed that many of these cover the requirements for the fourth quarter of the year as well as the third. The furnaces are correspondingly encouraged and are inclined to hold to their views as to prices. No great advance is expected, but there is an absence of the tendency to shade prices on good orders, which was so common a couple of month ago. Southern furnaces are asking 50c. a ton more, and one or two of the larger companies are out of the market for the present.

In finished material the business in structural steel continues good and the same may be said of plates, bars and several other branches. The railroads are coming forward more freely and several large orders for rails are understood to be pending besides those placed last week.

Baltimore

June 29—Included in the exports from this port for the week were 44,400 lb. tin scrap to Antwerp; 1,105,200 lb. steel billets and 653,600 lb. pipe to Glasgow; 4662 tons steel billets and 404 tons rail joints to Guaymas, Mexico; 2410 tons structural steel and 933,345 lb. pipe to Panama. Included in imports were 896 tons ferromanganese and 782 tons manganese ore.

Birmingham

June 28—The Southern pig iron market is active. Three companies are practically out of the market and two others are not anxious to sell at prevailing prices. The quotations have advanced to $12 per ton, minimum for No. 2 foundry, with $12.25 asked for last quarter's delivery. There is a large quantity of iron being sold right now. The stocks of iron on hand are being reduced steadily. The make is being held up as well as possible. The Tennessee company will put in blast three furnaces in the next week or two, one of them to go on basic iron. The Republic Iron and Steel Company will have to blow out a furnace for repairs. The Birmingham Coal and Iron Company will blow in No. 1 furnace to take the place of No. 2, which is undergoing repairs. The larger cast-iron pipe concerns in this section of the country are in the market for their fourth-quarter supply.

The steel demand is picking up. The receipt of the Harriman system order for 19,000 tons of rail at Ensley will mean much for the district.

The foundries and machine shops in Southern territory report an improvement in conditions.

Chicago

June 29—The iron market shows signs of general strengthening, but pig iron is still selling chiefly in small lots to melters that are not looking far ahead of their immediate needs. Some sales and many inquiries are being made for 1910 deliveries, but most business is in the fourth quarter, with some third-quarter requirements remaining unfilled. Southern iron is firmer, with some interests holding to $12@12.25 for last-quarter delivery, which means $16.35@16.60 Chicago. From a carload to 300 tons may be said to be the tonnage of nearly all sales, with here and there a heavier requirement, and with the number of sales large, showing general distribution among the melting industries. Northern iron is $16.50 for No. 2

with furnace agents very confident of the future and of firmer conditions continuing.

Sales of iron and steel products continue heavy and are increasing in almost every line, the most notable being railroad buying. Structural material and plates show large demand by the building interests using them, and machine supplies are increasing. Coke is in better demand, for last half delivery, with the price of first-class Connellsville $4.70 per ton.

Cleveland

June 29—Iron ore is moving freely, and there are plenty of vessels in commission. The results show that the strike has practically failed. Sales of ore continue to be made.

Pig Iron—There is rather a lull in the buying. Some small sales for quick delivery constitute about all the business for the week. Prices are firm at about $16 for bessemer; $15.50@15.75 for No. 2 foundry and $15 for gray forge.

Finished Materials—New sales have been rather light, but specifications on contracts are coming in well. Some trouble is expected at local rolling mills in the readjustment of the wage schedule, the present agreement ending with June.

Philadelphia

June 30—Interest has been developed in the pig-iron market within the past few days, owing to the strong probabilities of heavy ordering by large consumers for late delivery. It has been upward of two years since large consumers felt it to their interest to anticipate pig-iron requirements. A number of them have been doing so in a moderate way. There is an undertone to the market which may develop into an active and a heavy demand for all kinds of iron but especially basic, which may develop at any time. This is the view taken by the pig-iron makers and their representatives. There has been an advance in asking prices of 25 or 50c. a ton. Forge iron has improved as much as any other kind except in basic. Basic for early delivery is hard to get. Basic is quoted today at $15.50; gray forge at $15.25; and No. 2X foundry $16.50.

Steel Billets—A strong and healthy demand has forced billets up nominally 50c. per ton.

Bars—A general improvement has taken place and prices have been nominally advanced, though 1.45c. is still the quotation given for best refined bars. Common iron is in demand on a basis of 1.35c. though much recent business has been at a shading from that figure.

Sheets—The summer dullness is manifesting itself but the manufacturers are in pretty good shape.

Pipes and Tubes—The tone is decidedly better. Mills have a large amount of business from all over the country and there is an absence of any concessions.

Merchant Steel—Merchant steel is also active in a small way and small consumers are ordering more liberally.

Plates—The plate mills are having the time of their lives. An immense amount of car-building work is being booked. The retail demand for plate is also better.

Structural Material—The undertone of this market is stronger. Estimates for large requirements will soon be submitted. The retail demand in lots from 50 to 500 tons, is better.

Scrap—All kinds of scrap are stronger this week. Nearly all kinds are moving more freely. The best demand is for heavy steel melting scrap, No. 1 yard wrought and railroad. The yard men are elated with the prospects of cleaning out their yards in the next 30 days.

Pittsburg

June 29—At this writing the prospects are that there will be some closing of mills on account of certain interests failing to sign the Amalgamated Association scales, all of which expire June 30. These scales cover the iron mills, sheet mills and tinplate mills, but in none of the three branches does the union control all the mills. As to the sheet and tinplate scales, the American Sheet and Tin Plate Company, the subsidiary of the Steel Corporation, posted notices some time ago that after June 30 it would operate all its mills on the open-shop principle, which leaves it that the men will quit work on the night of June 30.

As to the iron scale, a settlement was reached last Friday at Cambridge Springs, Penn., between the Western Bar Iron Association, comprising most of the independent iron mills, which have been union, and the Amalgamated Association. The manufacturers signed last year's scale, with two modifications favorable to the men, one to the effect that all men shall be paid direct at the company's office, and the other that the manufacturers will coöperate with the union in having all employees members of the union in good standing. A continuous operation feature was also adopted, whereby pending scale settlement the mills may run during July.

The general iron and steel market is quieter as to new transactions, but has lost none of its strength or optimism. The total of specifications in June, received against old contracts, will easily exceed those for May. A quiet time is expected in the market in July and August, as is usually the case in these months, but the mills are practically assured of full operations.

Pig Iron—The Jones & Laughlin Steel Company has bought 25,000 tons of bessemer iron for September and October delivery at $15.25, Valley, or $16.15, Pittsburg, this following the purchase of 5000 tons of prompt iron by the Republic company at the same price. There is an inquiry from another steel interest for 10,000 tons. The market is now quoted at $15.50, Valley. Occasional sales of basic iron have been made at $15, Valley, and the market is firm at that price. Inquiry for foundry iron has been lighter this week than last, but the market shows an advancing tendency, the minimum being $15, Valley, with some furnaces quoting $15.25@15.50. Malleable is nominally quoted at $15.25, Valley, although no sales have been made recently. Forge is quotable at $14.25, Valley.

Steel—Billets are $23, Pittsburg, and sheetbars $25 to $25.50, delivered, Pittsburg, with premiums on open-hearth material.

Sheets—Production has continued to increase slowly. Should all the union sheet mills be closed the production of the non-union mills would tide over for a time. The market remains quotable at 2.20c. for black and 3.20c. for galvanized, these prices being shaded less frequently than formerly.

Ferromanganese—The market has been rather quiet, and prices are unchanged, on the basis of about $41, Baltimore, or $42.95, Pittsburg, for prompt, with a slight advance for contracts for next year.

Foreign Iron

Belgian Iron—Pig-iron production in Belgium in May was 111,590 metric tons in 1908, and 139,570 in 1909; an increase of 27,980 tons. There were 36 furnaces in blast this year.

Metal Markets

New York, June 30—The metal markets are quiet for the most part, though there is some speculative activity in copper. No important changes in prices are noted.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1909..	$11,171,265	$ 2,263,721	Exp. $ 8,907,544
" 1908..	26,555,913	3,101,002	Exp. 23,464,911
Year 1909..	55,487,891	17,767,857	Exp. 37,720,034
" 1908..	44,891,257	22,958,223	Exp. 21,933,034
Silver:			
May 1909..	4,428,448	3,857,388	Exp. 571,060
" 1908..	4,028,334	3,389,568	" 638,766
Year 1909..	23,854,629	18,532,453	" 5,822,176
" 1908..	21,077,185	17,688,150	" 3,389,035

Exports from the port of New York, week ended June 26: Gold, $1,020,500, chiefly to Argentina; silver, $806,335 to London and Paris. Imports: Gold, $100,961; silver, $108,362, from South America and Mexico.

Gold and silver movement, port of San Francisco, five months ended May 31:

	Coin.	Bullion.	Total.
Imports:			
Gold	$12,100	$1,282,040	$1,294,140
Silver	94,202	1,039,487	1,133,689
Exports:			
Gold	5,000	500	5,500
Silver	171,970	2,729,776	2,901,746

The imports are chiefly from Mexico and South America.

Foreign commerce of United States, five months ended May 31, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1908.	1909.
Exports	$ 762,428,233	$ 670,587,509
Imports	430,344,227	593,327,531
Excess, exports	$ 332,084,006	$ 77,259,978
Add excess of exports, silver		5,322,176
Add excess of exports, gold		37,720,034
Total export balance		$ 120,302,188

The gold and silver movement in detail is given in the table at the head of this column.

Gold—The demand for gold in the open market in London was not pressing. Some of the metal arriving went to the Bank of England and some to Germany. The price remained at 77s. 9d. per oz. for bars. In New York some gold went to South America and $2,000,000 to Holland.

Platinum—Prices remain unchanged, dealers still quoting $22.50@$23 per oz. for refined platinum; $25 for hard metal and $18@$20 for good scrap. Business is improving, being unusually active for summer.

Silver—Operations have been confined chiefly to Indian bazar buying, with China both buying and selling. The tendency and the result of these couple of operations has been to cause some decline in the price of silver. But although stocks are large, favorable crop conditions can easily cause a change in the situation with improvement in price.

SILVER AND STERLING EXCHANGE

June.	24	25	26	28	29	30
New York	52⅛	52⅛	52⅛	52⅜	52	52⅛
London	24⅛	24 1/16	24	24 1/16	23 15/16	24
Sterling Ex.	4.8815	4.8815	4.8810	4.8810	4.8810	4.8810

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to June 17, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India	£ 3,825,658	£2,599,400	D. £1,226,258
China	516,400	1,075,100	I. 558,700
Straits	90,510	82,800	D. 7,710
Total	£ 4,432,568	£3,757,300	D. £ 675,268

Imports for the week, £1000 from Chile, £5000 from the West Indies, £87,000 from New York; total, £93,000. Exports, £1500 to Egypt, £287,500 to India; £289,000 in all.

Exports of minerals from New Caledonia for the two months ended Feb. 28 are reported as follows by the *Bulletin du Commerce*, of Noumea, in metric tons:

Nickel ore	8,778
Cobalt ore	274
Iron ore	11
Chrome ore	679

Shipments, except those of nickel ore, have been light this year.

Copper, Tin, Lead and Zinc

June.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
24	13⅜ @13⅝	13 @13⅛	59⅛	29⅛	4.35	4.27½ @4.32½	5.27½ @5.32½
25	13⅜ @13⅝	13 @13⅛	59⅜	29⅛	4.35	4.27½ @4.32½	5.27½ @5.32½
26	13⅜ @13⅝	13 @13⅛	....	29⅛	4.35	4.27½ @4.32½	5.27½ @5.32½
28	13⅜ @13⅝	12⅞ @13⅛	59⅛	29¼	4.35	4.27½ @4.30	5.27½ @5.32½
29	13⅜ @13⅝	12⅞ @13⅛	58⅞	29⅛	4.35	4.27½ @4.30	5.27½ @5.32½
30	13⅜ @13⅝	12⅞ @13⅛	59	29⅛	4.35	4.27½ @4.30	5.27½ @5.32½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—A short-lived spurt of activity the beginning of the week, occasioned by a rally in London, and a subsequent drifting into utter lifelessness, characterizes the copper market of this week. Prices at the close are again at 13⅜@13⅝c. for Lake copper; 12⅞@13⅛c. for electrolytic in cakes, wirebars or ingots. The average of the week for casting copper has been 12¾@13c.

Some large orders of American origin appeared in the London market in the early part of the week, bringing about a sharp rally. Since then prices have lost about half of the advance, and the close is cabled steady at £59 for spot and £59 7s. 6d. for three months.

For refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £61 10s.@£62 10s.; strong sheets, £73 10s.@£75 10s.

The activity that characterized the end of May extended into the early part of June, and an outburst of speculative buying in all the European markets carried prices farther upward, the basis of 13½c. for electrolytic being reached. About the middle of the month speculative selling led to a decline, and later on the market became deluged with offerings from these sources which precipitated a decline to a basis of 13c. Some of the agencies, having disposed of their current output, refused to follow the decline and withdrew from the market, but the majority were free sellers at the lower level, and in certain quarters there was considerable pressure to sell. As a whole, the month was characterized by the influence of speculative transactions which were conducted upon a large scale. During the last week there was pronounced dullness, the closing prices being on the basis of 13c. for electrolytic and 13½c. for Lake. The unusual disparity in price between the two kinds during the latter part of June was owing to the absence of pressure to sell Lake, which is now very closely held.

Exports of copper from New York and Philadelphia for the week were 7948 long tons. Our special correspondent gives the exports from Baltimore at 1176 tons copper.

Imports and exports of copper in Germany, four months ended April 30, reported by Aron Hirsch & Sons, in metric tons:

	1908.	1909.	Changes.
Imports	56,533	49,323	D. 7,210
Exports	2,723	2,703	D. 20
Excess, imports	53,810	46,620	D. 7,190

Of the imports this year 45,026 tons were from the United States.

Tin—The London market dragged along in a listless fashion, with a weak tendency, and closed at £132 2s. 6d. for spot and £133 15s. for three months.

Large arrivals of tin brought about a weaker tone in the domestic market, where holders of spot material were anxious to realize. The business transacted was insignificant and the close is steady at 29⅛ cents.

Exports of tin from the Straits, four months ended April 30: United States, 6134; Great Britain, 10,197; other Europe, 1820; China and India, 702; total, 18,853 long tons, or 644 tons less than in the corresponding period last year.

Tin output of Federated Malay States, five months ended May 31 was 19,033 long tons in 1908, and 18,196 in 1909; decrease, 837 tons.

Lead—The market is dull and the tendency somewhat easy at 4.27½@4.30c. St. Louis and 4.35c. New York.

The London market again comes lower, the close being cabled at £12 17s. 6d. for Spanish and £13 for English lead.

Spelter—Business in this metal has also been of small volume, but prices have been holding firm at 5.27½@5.32½c. St. Louis, and 5.42½@5.47½c. New York.

New York quotations for spelter were 5.42½@5.47½c., June 24 to 30, inclusive.

The London market is firm at £22 for good ordinaries and £22 5s. for specials.

Other Metals

Antimony—Business is dull. Prices are rather nominal at 8½c. for Cookson's, 7¾c. for U. S., and 7¼@7½c. for outside brands.

Aluminum—No. 1 ingots are quoted 22@24c. base; wire, 31@32c. base; sheets 33@34c. base.

Quicksilver—There has been no change in prices. New York quotation is $44.50 per flask of 75 lb. San Francisco, $44 for domestic and $42 for export. London price is £8 7s. 6d. per flask, but jobbers offer at 5s. less.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations 75c. per lb., in 100-lb. lots, at Cleveland, Ohio. In Germany, 450@475 marks per 100 kg. at factory.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Imports and Exports of Metals

Exports and imports of metals in the United States, five months ended May 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	119,323	59,622	Exp. 59,701
Copper, 1908...	139,793	30,461	Exp. 109,332
Tin, long tons....	188	18,329	Imp. 18,141
Tin, 1908.....	130	14,693	Imp. 14,563
Lead, short tons.	39,234	47,351	Imp. 8,117
Lead, 1908.....	33,313	47,429	Imp. 14,116
Spelter, sh. tons	2,127	1,289	Exp. 838
Spelter, 1908....	1,555	338	Exp. 1,217
Nickel, lb.	4,838,123	8,633,910	Imp. 3,795,787
Nickel, 1908....	5,388,855	6,089,531	Imp. 700,676
Antimony, lb.....	4,032	4,047,018	Imp. 4,042,986
Antimony, 1908.		3,261,495	Imp. 3,261,495
Platinum, oz.....	.....	46,385	Imp. 46,385
Platinum, 1908.		15,412	Imp. 15,412
Quicksilver, lb	149,858	.....	Exp. 149,858
Quicksilver, '08	83,874	.....	Exp. 83,874
Aluminum, value	$223,892	.....	Exp. $223,892
Aluminum, 1908	162,681	.....	Exp. 162,681
Ores, etc.:			
Zinc oxide, lb. ..12,282,000		.....	Exp.12,282,000
Zinc oxide, '08..10,464,879		.....	Exp.10,464,879
Zinc dross, lb.... 9,118,977		.....	Exp. 9,118,977
Zinc dross, '08..10,599,983		.....	Exp.10,599,983
Zinc ores, lg. tons	6,060	44,176	Imp. 38,116
Zinc ores, 1908.	12,669	14,134	Imp. 1,465
Antim'y ores, lb.	504	3,428,498	Imp. 3,427,994
Ant. ores, 1908.	.....	416,747	Imp. 416,747
Chrome ore.....	.....	17,741	Imp. 17,741
Chrome ore, '08	.....	.....	.....

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Imports of zinc ores in 1909 included 34,863 tons calamine and 10,313 tons other ores, against 7362 and 6772 tons, respectively, in 1908. Chrome ore was not reported separately last year.

Zinc and Lead Ore Markets

Platteville, Wis., June 26—The base price paid this week for 60 per cent. zinc ore was $44 per ton; no premium price is reported. For 80 per cent. lead ore, $57.50@58 was paid.

SHIPMENTS, WEEK ENDED JUNE 26.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	731,900	.....	164,200
Hazel Green	395,800	.....	.....
Cuba City	313,300	103,610	.....
Galena.....	308,000	.....	.....
Days Siding.....	264,000	.....	.....
Benton.	227,800	.....	.....
Harker.....	194,420	.....	.....
Strawbridge	176,000	.....	.....
Mineral Point.....	160,000	.....	.....
Livingston	80,000	.....	.....
Rewey	.....	.....	67,700
Montfort.....	80,000	.....	.....
Linden.....	48,650	.....	.....
Total.....	2,979,870	103,610	231,900
Year to June 26.....	57,773,925	2,497,090	4,853,300

In addition to the above there was shipped to the American Zinc Ore Separating Company, 317,100 lb., and to the Joplin Separator Works, 147,000 lb. zinc concentrates.

The year's shipment of zinc ore to June 26 shows an increase of 7434 tons over the first six months of last year. A late wet Spring and heavy wagon roads curtailed production and shipment.

Joplin, Mo., June 26—The highest price paid for zinc sulphide ore was $47.50 per ton, the assay base being quoted at $44@45 per ton of 60 per cent. zinc. Zinc silicate sold as high as $23 on a base of $17 per ton of 40 per cent. zinc. The average price, all grades, was $40.78. The highest price paid for lead was $59, a decline of $1, but the bulk of ore sold at the high price, averaging, all grades, $57.96 per ton.

Heavy buying characterized the zinc market, a large tonnage of the Chicago-Joplin company and the Oronogo-Circle company being purchased this week. The shipment was an increase of a little over 1000 tons. Continued rain has reduced the output of silicate, a water spout last night washed out many water reservoirs; the Alba-Neck output is largely curtailed by excessive water in the ground. With the increased shipment there is a very close margin of purchasable ore. The stock is, approximately, 7000 tons, of which 2800 tons are not on the market and about 3100 sold, but not delivered.

SHIPMENTS, WEEK ENDED JUNE 26.

	Zinc, lb.	Lead, lb.	Value.
Webb City Carterville	3,486,520	436,620	$ 87.620
Joplin.....	2,307,010	161,520	54,920
Miami.....	917,120	122,160	19,591
Galena	741,380	55,840	17,558
Duenweg.....	561,230	60,170	13,810
Oronogo	597,810	6,870	13,756
Alba-Neck.....	446,180	....	10,038
Prosperity.....	368,640	40,210	9,091
Zincite	340,230	2,350	7,719
Granby	417,040	66,670	7,331
Aurora	475,630	26,100	7,277
Spurgeon.....	317,460	99,290	7,255
Quapaw.....	299,430	9,560	6,415
Carthage	270,040	.....	6,075
Sarcoxie.....	334,270	.....	5,003
Badger	222,220	.....	4 888
Carl Junction.....	85,390	.....	2,000
Saginaw-Shoalsburg..	92,760	11,540	1,943
Totals	12,280,360	1,098,830	$282,290
Six months.....	293 631,420	46,709,640	$6,668,626

Zinc value, the week, $250,436; 6 months, $5,413 643
Lead value, the week, 31,854; 6 months, 1,254,983

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January.....	$37 60	$41.25	$35.56	$38 46	$46 88	$52 17
February...	36.63	36.94	34.92	34.37	49 72	50.50
March.....	36.19	37.40	34.19	34.71	49 90	50 82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56 05	56.59
June.....	33.06	.....	32.07	.....	60.48	.....
July	34.55	.....	31.67	.....	59 90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October.....	35.95	.....	33.28	.....	52.63	.....
November...	39.13	.....	35.02	.....	54.53	.....
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

On June 25 the Standard Oil Company announced a reduction of 5c. per barrel in the price of crude petroleum. The new quotations are: Pennsylvania, $1.63; Mercer Black, $1.10; New Castle, $1.07; Corning, 99c.; Cabell, $1.17; North Lima, 89c.; South Lima, 84c.; Indiana, 84c.; Somerset, 75c.; Ragland 55c. per barrel.

Chemicals

New York, June 30—Business generally continues fair, but dealers look for the usual quiet through July and August.

Copper Sulphate—Quotations are unchanged at $4.22½c. per 100 lb. for carload lots, and $4.32½@$4.35 for smaller parcels. Sales have been light.

Nitrate of Soda—Prices are firm at 2.15c. for spot and 2.12½c. for futures. A good amount of business is being done.

Arsenic—Prices are a little firmer at 2⅞@3c. for white arsenic. The market has improved and sales are larger.

Imports and Exports—The imports and exports of chemicals and raw materials in the United States, five months ended May 31, were as follows:

	Imports.	Exports.	Excess.
Copper sulph. lb.	1,954,388	E.	1,954,388
Bleach, lb.....	35,965,919	10,607	I. 35,955,312
Potash salts, lb..	167,001,772	1,671,812	I. 165,329,960
Soda salts, lb. ..	5,923,908	274,152	I. 5,649,756
Acetate lime, lb.	38,168,797	E.	38,168,797
Nit. of soda, tons	134,001	3,260	I. 130,741
Phosphates, tons	5,586	446,571	E. 440,985
Sulphur, tons....	11,819	9,828	I. 1,991
Pyrites, tons.....	280,481	.....	I. 280,581

Estimating sulphur contents of pyrites the total imports of sulphur this year were 124,011 tons.

Mining Stocks

New York, June 30—The recession on the Stock Exchange has been less marked during the past week, and prices have been rather uncertain, on a much smaller volume of business than has been the case for some weeks. The net result of the week has shown advances in a few stocks, but declines in a number of others. The extreme hot weather and the beginning of the vacation season have had some effect upon the market. It has been for the most part professional, and in the absence of some of the larger operators it has been without any particular direction.

On the Curb trading in the copper stocks was rather dull and irregular, with business on a moderate scale and some declines for the week. There was some activity in the Colbalt stocks with a disposition to trade more actively than in the coppers. Other stocks were rather neglected.

Boston, June 29—It has been a dull and monotonus market for mining shares, yet prices have held fairly well. American Zinc, Lead and Smelting has been the exception and has shown a steady advance, due to the fact that this commodity will receive favorable attention in the new tariff bill. The price has risen from $27.12½ in the week's time to $30.75. As there are but 80,0000 shares of stock outstanding it has been an easy matter to advance the price on light dealings.

A trifle more animation today caused a better feeling, although as yet mining shares are neglected. Osceola directors declared a $4 semi-annual dividend today, which is the same as the last payment. Calumet & Hecla will benefit to the extent of close to $130,000 by this declaration as its ownership is over 32,000 shares of Osceola stock. This, by the way, is the first dividend declaration made by the new board of directors.

The Shannon mine's $500,000 bond issue was practically all subscribed for by stockholders. The rights sold as high as 30c. and as low as 10c. The stock in the meantime has done little. A $1 assessment now seems likely by the Adventure within a short time to carry on development work. The Quincy company has made final payment to the Franklin for the latter's old mill site. The total amount involved was $170,000.

Vulture has been conspicuous on the Curb with an advance of almost $1 to $8.37½. Raven was irregular on the announcement of a 25c. assessment.

STOCK QUOTATIONS

NEW YORK June 30	
Name of Comp.	Clg.
Alaska Mine	.15
Amalgamated	82¾
Anaconda	49¼
Balaklala	‡2¼
British Col. Cop.	7⅛
Buffalo Mines	3½
Butte Coalition	25⅛
Colonial Silver	.30
Cum. Ely Mining	8
Davis-Daly	5¾
Dominion Cop.	7
Douglas Copper	2⅜
El Rayo	2
Florence	3½
Foster Cobalt	.32
Furnace Creek	.06
Giroux	7⅝
Gold Hill	⅛
Goldfield Con.	7
Granby	101
Greene Gold	½
Greene G. & S.	9
Guanajuato	1⅛
Guggen. Exp.	196
Hanapah	‡ 15
Kerr Lake	7⅞
McKinley Dar.	.92
Miami Copper	16
Micmac	⅜
Mines Co. of Am.	⅛
Montezu. of C. R.	30
Mont. Sho. C.	1
Nev. Utah M. & S.	1⅛
Newhouse M. & S.	1⅝
Nipissing Mines	10⅝
Old Hundred	⅜
Silver Queen	.35
Stewart	
Tennessee Cop'r.	38¾
Tri-Bullion	
United Copper	10⅜
Utah Apex	6⅛
Utah Copper	49⅜
Yukon Gold	4⅛

†Ex. Rights.

BOSTON June 30	
Name of Comp.	Clg.
Adventure	7¼
Alloues	42
Am. Zinc	30⅝
Arcadian	4
Arizona Com.	39¾
Atlantic	‡9½
Boston Con.	14⅜
Calumet & Ariz.	104
Calumet & Hecla	650
Centennial	33
Copper Range	82¼
Daly-West	8¼
East Butte	12½
Franklin	17¾
Greene—Can.	10
Hancock	9¾
Isle Royal	26
Keweenaw	4¼
La Salle	13
Mass	9
Michigan	10¾
Mohawk	65½
Nevada	23¼
North Butte	57⅝
Ojibway	10¾
Old Colony	‡.60
Old Dominion	54
Osceola	136
Parrot	31
Quincy	90
Rhode Island	‡4¾
Shannon	15½
Superior	42
Superior & Bost.	15½
Superior & Pitts.	14½
Tamarack	70
Trinity	‡12
U. S. Smg. & Ref.	49¾
U.S. Sm. & Re., pd.	50
Utah Con.	42½
Victoria	‡4½
Winona	‡5¾
Wolverine	152
Wyandotte	‡2¾

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	44¼
Am. Smelt. & Ref.	92
Am.Sm. & Ref., pf	110⅞
Colo. Fuel & Iron.	44¼
Federal M. & S., pf.	‡88¾
National Lead	85⅞
National Lead, pf.	‡107
Pittsburg Coal	‡11¼
Republic I. & S.	31¾
Republic I. & S., pf.	104⅜
Sloss-Sheffield	82½
Standard Oil	‡685
U. S. Steel	69
U. S. Steel, pf.	126¾
Va. Car. Chem.	54¾

BOSTON CURB	
	Low.
Ahmeek	170
Chemung	13
Chino	8⅜
Corbin	7
Globe Con.	4
Helvetia	5½
Ray Central	2⅜
Ray Con.	16⅜
San Antonio	9

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS June 26		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	05
Center Cr'k	2 00	1 50
Cent.C.& C.	82 00	80 00
C.C. & C. pf.	80 00	80 00
Cent. Oil	110 00	100 00
Columbia	8 00	5 00
Con. Coal	20 00	19 00
Doe Run	110 00	100 00
Gra. Bimet.	35	.27½
St. Joe	12.00	11 00

LONDON July 3	
Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton'sInd.	0 3 1½
Camp Bird	1 8 6
Esperanza	2 15 0
Tomboy	1 2 6
El Oro	1 6 3
Oroville	0 13 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. June 23.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	48
Best & Belcher	40
Caledonia	.32
Challar	.18
Comstock	.30
Con. Cal. & Va.	88
Crown Point	.47
Exchequer	27
Gould & Curry	20
Hale & Norcross	26
Mexican	1 02
Ophir	1 47
Overman	32
Potosi	27
Savage	.24
Sierra Nevada	.30
Union	48
Utah	05
Yellow Jacket	.51
TONOPAH STOCKS	
Belmont	.85
Extension	.48
Golden Anchor	‡ 51
Jim Butler	.09
MacNamara	.24
Midway	.20
Montana	.60
North Star	02
Tono'h Mine of N.	6.62½
West End Con.	.20
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.10
Blue Bell	02½
Booth	.11
C.O.D. Con.	.11
Columbia Mt.	.10
Comb. Frac.	.60
Con. Red Top	‡ 57
Cracker Jack	02
Dia'dfield B. B. C.	03
Goldfield Belmont	04
Goldfield Daisy	26
Great Bend	05
Jumbo Extension	10
Kendall	02
Lone Star	.03
May Queen	03
Oro	.06
Red Hill	.05
Sandstorm	08

Name of Comp.	Clg.
Silver Pick	.10
St. Ives	.10
Triangle	.01
BULLFROG STOCKS	
Gibraltar	02
Homestake King	01
Mont. Shoshone C.	1.50
Tramp Cons.	.05
MISCELLANEOUS	
Cumberland Ely	7.87½
Giroux	7.62½
Greenwa'r Copper	05
Nevada Con.	23.12½
Nevada Hills	.87½
Nevada Smelting	1 00
Nevada Wonder	.40
Nevada-Utah	1 87½
Penn-Wyoming	...
Pittsburgh S. Pk.	47
Ray Central	2 43¾
Ray Con.	16.75
Round Mt. Sphinx	10

COLO. SPRINGS June 25	
Name of Comp.	Clg.
Acacia	.07
C. C. Con.	.03½
Dante	‡.05½
Doctor	.09¾
Elkton	.63
El Paso	.51¾
Findlay	.14½
Gold Dollar	.11
Gold Sovereign	.03
Isabella	.23½
Jack Pot	.07
Jennie Sample	.07¾
Jerry Johnson	.06
Lexington	‡.02
Mary McKinney	38
Pharmacist	‡.02¾
Portland	.85
Prince Albert	.02
Vindicator	.58¼
Work	‡.06¾

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev	July 15	Aug. 6	$0.05
Best & Belcher, Nev	July 20	Aug. 10	0.10
Black Jack, Utah	June 15	July 8	0.01
Brunswick Chol., Nev	July 10	Aug. 2	0.01
Brunswick Potosi, Nev.	July 10	Aug. 2	0.01
Bullion, Nev	June 14	July 13	0.05
Challenge Con., Nev	June 22	July 13	0.05
Mexican, Nev.	June 28	July 14	0.10
Mountain Dell, Utah	July 19	Aug. 5	0.01½
N. Y. Bonanza, Utah	July 10	July 31	0.03
Potosi, Nev	July 9	Aug. 2	0.10
Progressive, Utah	June 23	July 14	0.01
Scorpion, Nev.	June 14	July 6	0.02
Scottish Chief, Utah	July 7	Aug. 4	0.01
Seg. Belcher, Nev	July 7	July 29	0 03
Seven Troughs Mon., Nev.	June 23	July 10	0.00½
Sierra Nevada, Nev.	July 15	Aug. 10	0.10
Silver King Con., Utah	July 6	July 17	0.10
Union Con., Nev	June 28	July 19	0.10
W. Con. Va., Nev	July 16	Aug. 10	0.10
Yellow Jacket, Nev	July 13	Aug. 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51 750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51 428	25.133	23.708
May	52.795	52.905	24.377	24 343
June	53.663	52.538	24.760	24.166
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23 877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13 893	13.901	14 280	62.386	57.688
February	12.905	12 949	13.098	13 295	58.786	61.198
March	12.704	12 387	12.875	12 826	58.761	56.231
April	12.743	12 56¼	12 928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57 387	59.338
June	12.675	13.214	12.877	13.548	57 842	59.627
July	12.702	.....	12 933	.....	57.989	.....
August	13.462	.....	13 639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28 060	July	29.207	.....
February	28.978	28 290	August	29.942	.....
March	30.577	28.727	September	28.815	.....
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30.348	.....
June	28.024	29 322	December	29.154	.....
			Av. Year.	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4 168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.320	4 291	12.600	13.031
July	4.744	.....	.....	13.000	.....
August	4.580	.....	.....	13.375	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4 757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	.....	4.338	.....	19.031	.....
August	4.702	.....	4.556	.....	19.350	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM

9638—LATERITE—Report on Laterites from the Central Provinces. Wyndham R. Dunstan. (Rec. Geol. Surv. India, Vol. XXXVII, Part 2, 1908; 8 pp.) The author gives a number of chemical analyses of various samples of laterites with some notes on the possibility of using them as a source of aluminum.

9639 — PRODUCTION of Bauxite and Aluminum in 1908. W. C. Phalen. (Advance Chapter from Mineral Resources of the U. S., 1909; 13 pp.) Gives statistics of the production of bauxite and aluminum for several years, with notes on the present status of the industries.

ARSENIC

9640—OCCURRENCE, USES, ETC.—Arsenic. E. B. Wilson. (Mines and Minerals, June, 1909; 1¾ pp.) Notes on the uses, occurrence and tests for arsenic. Methods of analysis, metallurgy and antidotes for poisoning. 20c.

ASBESTOS

9641—AMALGAMATED ASBESTOS CORPORATION, LIMITED, The. J. J. Harpell. (Can. Min. Journ., June 15, 1909; 3 pp.) The author in this article analyzes the claims set forth by the Asbestos Corporation and also the figures advanced by Mr. Cirkel. 20c.

BAUXITE

9642 — PRODUCTION of Bauxite and Aluminum 1908. W. C. Phalen. (Advance Chapter from Mineral Resources of the U. S., 1909; 13 pp.) Gives statistics of the production of bauxite and aluminum for several years, with notes on the present states of the industries.

CALCIUM CARBIDE

9643 — MANUFACTURE of Calcium Carbide. (Engineering, May 28 and June 11, 1909; 5 pp.) Illustrated description of the works of the Northwestern Cyanamide Company at Odda giving notes on the manufacture of nitrolim and the extraction of nitrogen from the air. Conclusion of article previously, indexed. 40c.

CEMENT

9644 COLORADO—Portland Cement Material in Colorado. A. Lakes. (Min. Sci., June 3, 1909; 1¾ pp.) Describes the geology of the region, pointing out the occurrence of limestone and shale capable of making portland cement. Discusses the requirements for cement material. Illustrated. 20c.

9645—MILLS of the Cowell Portland Cement Company. (Eng. Rec., May 8, 1909; 2½ pp.) A description of the cement plant and its equipment recently installed near San Francisco by the Cowell Portland Cement Company. Capacity of plant 4000 bbl. daily. Illustrated. 20c.

9646—PLANT—Description of the Allentown Portland Cement Company's Plant. (Chem. Engr., May, 1909; 3 pp.) Description of a new plant located at Evansville, Penn., which when fully completed will have a total capacity of 5000 tons per day. 40c.

9647 — PORTLAND CEMENT — Critical Economies in Portland Cement Production. E. A. Richmond. (Eng. Rec., May 15, 1909; 2 pp.) Notes on the cost of various operations in the manufacture of portland cement, together with some observations on the effects of fine grinding of the raw material. Illustrated. 20c.

9648—PRESENT STATUS and Technology of the Portland Cement Industry. (Chem. Engr., May, 1909; 4½ pp.) This subject is covered in a general manner, all the salient features being enlarged upon. Illustrated. 40c.

9649 — TESTING—Standard Methods of Testing Cement. Carney Hartley. (Min. Sci., May 20, 1909; 2½ pp.) An article dealing with the importance of a proper test of the cement prior to use, giving specifications and the method of determining quality. 20c.

COAL AND COKE

9650—COAL BRIQUETTING. C. Scholz. (Journ. Western Soc. Engrs., April, 1909; 17 pp.) Notes on the manufacture of briquets from fine waste coal producing a fuel of high efficiency. 40c.

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9755—RECENT PROGRESS in Our Iron and Steel Industries. F. W. Harbord. (Iron and Steel Times, May 6, 1909; 6 pp.) Introductory article dealing with general improvements of practice in the iron and steel industries.

9756—ROLLING MILL MOTORS. E. W. Yearsley. (Proc. A. I. E. E., July, 1909; 2 pp.) This article points out a number of details that should be carefully attended to where motors are installed.

9757—ROLLING MILL PRACTICE—Power Requirements for Rolling High-Carbon Steel of Small Section. Brent Wiley. (Proc. A. I. E. E., July, 1909; 6½ pp.) Describes the series of tests made at a 9-in. merchant mill. Complete data and plots are given. $1.20.

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9763—STORAGE BATTERIES—The Application of Storage Batteries to the Regulation of the Alternating-Current Load at the Plant of the Indiana Steel Company, Gary, Indiana. J. L. Woodbridge. (Proc. A. I. E. E., July, 1909.) Describes briefly the battery plant and accessories and dwells more particularly upon a few of the features, giving an account of the actual commercial operation. $1.20.

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9769—WHITE LEAD—Manufacture and Properties of Mild Process White Lead. C. D. Holley. (Journ. Soc. Chem. Ind., Apr. 30, 1909; 1¾ pp.) This method is the only one in practical operation in this country which does not require the use of acids, alkalies or other chemicals in the process of manufacture.

9770 — SUBLIMED WHITE LEAD—L. F. Hughes. (Journ. Soc. Chem. Ind., Apr. 30, 1909; 1¼ pp.) This article gives the essential chemical and physical data of manufacture and properties of sublimed white lead.

MAGNESITE

9771—CALIFORNIA—Margarita Magnesite. Edmund Mitchell. (Los Angeles Min. Rev., May 29, 1909; 3½ pp.) A description of large deposits which have been secured for exploitation by Los Angeles men. Notes on the uses and commercial importance of magnesite. Illustrated. 20c.

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MANGANESE

9773—INDIA—Three New Manganese-Bearing Minerals: Vredenburgite, Sitaparite and Juddite. L. L. Fermor. (Rec. Geol. Surv. Ind., Vol. XXXVII, Part 2, 1908; 14 pp.) The author gives a description of each of these three new minerals, together with their chemical composition. Also some notes on their crystal structure.

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9792—MONAZITE AND ZIRCON—The Production of Monazite and Zircon in 1908. D. B. Sterrett. (Advance Chapter from Mineral Resources of the U. S., 1909; 6 pp.) Deals with the occurrence, production imports and exports of these substances.

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9796—CHEMISTRY OF SULPHUR—Some Useful Lessons of Limewater. Charles S. Palmer. (Power, June 8, 1909; 2½ pp.) An interesting chapter on the chemistry of sulphur; how to make hydrogen from sulphide; what it will do; different sulphur forms. Illustrated. 20c.

9797—WYOMING—Sulphur Deposits near Thermopolis, Wyo. E. G. Woodruff. (Advance Chapter from Bull. 380, U. S. Geol. Surv., 1909; 8 pp.) Describes the geological occurrence, and mining methods employed, at Thermopolis, Wyo.

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9798—HISTORY, USES, ETC.—Tin—Its History, Uses and Occurrences. Arthur Lakes. (Min. Wld., June 19, 1909; 2 pp.) The geology and mineralogy, history, uses and sources of tin are treated. The object of this article is to familiarize the reader with tin mining. Drawings of tin minerals are given. 20c.

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9801—WEST AUSTRALIA—Notes on the Geology of the Greenbushes Tinfield with Special Reference to the Deep Leads. Harry P. Woodward. (W. A. Geol. Surv. Bull. No. 32, 1908; 68 pp.) Geological description of the regions, describing mining operations. Illustrated.

TUNGSTEN

9802—ANALYTICAL METHOD—The Determination of Tungstic Acid in Low-grade Wolfram Ores. H. W. Hutchin and F. J. Tonks. (Trans. I. M. M., May 13, 1909; 11 pp.) Describes a new method which combines the accuracy of the mercurous nitrate method with an improvement in the attack of the mineral. Gives a tabulation of the results obtained in a number of assays.

ZINC

9803—VAPOR-GALVANIZING. S. Cowper-Coles. (Journ. Soc. Chem. Ind., Apr. 30, 1909; 4¼ pp.) The features of this process and the apparatus used are described; discussion on the method is also given. Illustrated.

9804—ZINC AND LEAD ANNUAL for 1909. (Published by Eberle & Co., Joplin, Mo., 1909; 38 pp.) This booklet describes the mining industry of Missouri,—Kansas,—Oklahoma, zinc-lead district, and gives figures pertaining to the mineral output for the various years since discovered. 20c.

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9805—ARGENTINA—The Ore Deposits of the Sierra de Cordoba, Argentine Republic. G. Bodenbender. (Min. Journ., May 29 and June 5, 1909; 1½ pp.) Notes on the topography and geology of the Cordoba mountains, together with a description of the gold ore deposits and the galena and blende, galena and vanadium, copper and magnetite, wolframite, stribnite, chromite and manganese deposits. 60c.

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MINING—GENERAL

9814—BLASTING—The Theory of Blasting with High Explosives. E. M. Weston. (Journ. Chem., Met. and Min. Soc. of South Africa, Apr., 1909; 2½ pp.) This paper is a reply to discussion of a former article on blasting and brings out a number of useful hints for blasting practice. 60c.

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9820—CONSERVATION of Natural Resources. James Douglas. (Bull. A. I. M. E., May, 1909; 13 pp.) The author deals with the conservation of mineral resources of the country and the utilization of the by-products. He also gives some figures on the the amount of timber used in mining operations.

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9829—MINING LAW—New Mining Law of Nevada. (Salt Lake Min. Rev., May 15, 1909; 1½ pp.) This article gives in full the new law that has just been passed by the Legislature and signed by the governor, the intent of which is to eliminate fraudulent mining operations. 20c.

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9833—QUEBEC—Mining Operations in the Province of Quebec for the year 1908. J. Obalski. (Dept. of Colonization, Mines and Fisheries, Quebec, 1909; 85 pp.) Notes and statistics covering the mining operations in a general way, together with a report on an exploration journey in Labrador and the region of Lake Chibougamau. The author gives notes on the geology and ore deposits of various mining districts. Illustrated.

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9835—RESCUE WORK—The Use of Oxygen in Mining Accidents. J. Robertson. (Coll. Guardian, Apr. 30, 1909; 1 p.) Notes on the necessity of oxygen gas as being a part of the plant equipment, together with its value in pit rescues. Illustrated. 40c.

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9840 — TRANSPORTATION — Mule-back Transportation of Sectionalized Machinery. F. C. Roberts and W. W. Bradley. (Min. and Sci. Press, May 29, 1909; 4½ pp.) A description of the methods of handling freight in remote districts as done by the Vantanas Mining and Exploration Company in Durango, Mexico. Illustrated. 20c.

9841—TRIBUTING. H. F. Lofts. (Min. Journ., June 5, 1909; 1¼ pp.) The author describes operation methods for practical miners working claims upon a royalty basis. The subjects of plant and development are especially treated. 40c.

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ORE DRESSING

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9845—SLIME TREATMENT—Theory of the Settlement of Slime. (Min. and Sci. Press, June 12, 1909; 2 pp.) A supplementary article to the one by H. S. Nichols, published in the *Min. and Sci. Press* of July 11, 1908, adding some information gained from the study of clay-working slips. Diagrams.

METALLURGY—GENERAL

9846—INDUSTRIAL BUILDINGS — The Design and Construction of Industrial Build-

ings.—I. Herbert F. Stimpson. (Eng. Rec., May 29, 1909; 3 pp.) First instalment of the article dealing with the methods of procedure in the designs of a building of a plant for the manufacture of an assigned product at a given rate. 20c.

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9850—SMELTER FUMES—Problems in the Utilization of Smelter Fumes. Joseph H. Hart. (Min. Wld., June 12, 1909; 1½ pp.) A review of the chemistry of the various sulphur compounds, methods of production and their position in the market. Also notes on the methods suggested for the alleviation of smelter fumes. 20c.

9851—SMOKE ABATEMENT CONFERENCES and Exhibitions. (Cassier's Mag., June, 1909; 4 pp.) A general discussion of the problem of smoke-abatement. 40c.

9852—SMOKE PREVENTION or Smoke Consumption. Harold V. Coes. (Eng. Mag., June, 1909; 11 pp.) The first instalment of this article recapitulates the causes of smoke and the principles of smokeless combustion, and describes the methods and devices by which smokeless combustion is assisted or attained in hand-fired furnaces. Drawings. 40c.

9853—SMOKE PREVENTION — Smoke Ordinances and Their Bearing on Industry. (Black Diamond, May 8, 1909; 2 pp.) Notes on smoke and its pollution of the atmosphere; the dust it produces and its relation to public health, together with notes on ordinances and the duties of inspectors. 20c.

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ANALYTICAL CHEMISTRY

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Corundum	"	.07@.10
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Grains	"	.03¼@.04
Naxos flour	"	.01¾@.02
Grains	"	.03¼@.04
Chester flour	"	.01¾@.02
Grains	"	.03½@.04
Peekskill flour, f.o.b. Easton, Pa	"	.01¼@.01¾
Grains, in kegs	"	.02¾@.03
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Pumice Stone, Am. Powd., 100 lb.		1.60@2.00
Italian, powdered	per lb.	.01¾@.01¾
Lump, per quality	"	.05@.30
Rottenstone, ground	"	.02¾@.04
Lump, per quality	"	.05@.30
Rogue, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.02¾ up
Boric	"	.07
Hydrofluoric, 30%	"	.02¾@.03¼
" 48%	"	.06
" 60%	"	.10
Hydrochloric acid, 20°, per lb.		1.25@1.50
Nitric acid, 38°	per lb.	.04¼@.04½
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.10
66°, bulk, ton		18.00
Oxalic	per lb.	.06¼@.07
ALCOHOL—Grain 95%	gal.	2.64
Denatured	"	.45@.47
Refined wood, 95@97%	"	.50@.55
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.03¾@.05
ALUMINUM—Sulphate, com'l.	lb.	1.50@1.75
AMMONIA—24 deg. lb.	"	.04½@.05½
" 26 deg. lb	"	.04¾@.05¼
AMMONIUM—		
Bromide	lb.	.28
Carbonate	"	.07¾@.09½
Muriate grain	"	.05¾@.06½
Lump	"	.09½@.09¾
Sulphate, 100 lb.		2.85@2.90
Sulpho-cyanide com	"	.30
" " chem. pure	"	.40
ANTIMONY—needle, lump	"	.03¾@.04
ARSENIC—White	"	.02¾@.03
Red	"	.07½@.08
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West Indies	"	20.00@60.00
Egyptian	lb.	.09@.10
Gilsonite, Utah ordinary	per ton.	32.00@40.00
Trinidad	"	20.00@25.00
California	"	22.00@28.00
BARIUM—		
Carb. Lump. 80@90%	lg. ton.	30.00@35.00
Precipitated 96@98%	"	36.00@40.00
Powdered, 80@90%	lb.	.02@.02½
Chloride com'l	ton.	37.00@39.00
Nitrate powdered, in casks	lb.	.05½@.06½
Blanc Fixe, dry, bbl.	per lb.	.02¾@.04
BARYTES—		
Am. Ground	sh. ton.	12.00@17.00
Floated	"	17.00@20.00
Foreigd floated	"	20.00@22.00
BISMUTh—Sub-nitrate	lb.	1.40@1.45
BLEACHING POWDER—35% 100 lb		1.25@1.50
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4.22½@4.35
BONE ASH	lb.	.02¾@.04
BORAX, sacks	"	.04½@.05
CALCIUM—Acetate, gray, 100 lb		1.75@1.80
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. N. Y.	"	11.00@14.10
CEMENT—		
Portland, Am. 500 lb	bbl.	1.50@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)	"	.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton.	14.00@16.00
Bricks, f.o.b. Pittsburg, per M.		175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	ton,	7.00@10.00
Foreign	"	10.00@17.50
COBALT—Oxide	lb.	1.10@1.50
COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.75
In bags	"	.60@.70
CRYOLITE	lb.	.06½@.06¾
FELDSPAR—Ground	sh. ton.	8.00@12.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	16.00
Extra	"	20.00@23.00
Special extra	"	30.00@35.00
FIRE CLAY—F.o.b. St. Louis.		
St. Louis, extra quality	per ton.	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	lg. ton.	8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock		8.00@10.00
FULLER'S EARTH—Lump, 100 lb.		.80@.85
Powdered	"	.80@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.02½@.04
Dust	"	.02½@.05
Chip	"	.04@.08
Lump	"	.05½@.12
Large lump	"	.08¼@.10½
GYPSUM—		
Fertilizer	sh. ton.	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb.	.01¾@.02½
German	"	.02½@.02¾
LEAD—Acetate (sugar of) brown,	lb.	.07¾@.08
Nitrate, com'l	"	.07¼@.08¼
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	7.50@8.50
Calcined, powdered	sh. ton.	26.00@37.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	.90@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.01@.01½
75@85% binoxide	"	.01¼@.01½
85@90% binoxide	"	.02@.05
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	16.00@32.50
MARBLE—Flour	sh. ton.	8.50@9.00
MINERAL WOOL—		
Slag, ordinary	sh. ton.	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, normal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb.	.09@.11
Sulphate, double	"	.06½@.08
NITRATE OF SODA—		
100 lb. 95%		2.15
95% for 1910		2.15
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.05½@.06¼
English glassmakers'	"	.08¼@.08½
Lithopone	"	.03¾@.07
Metallic, brown	sh. ton.	16.50@22.00
Red	"	14.00@18.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02¾@.03
French, washed	"	.01¼@.02
Paris green, pure, bulk	"	.21½
Red lead, American	"	.06@.06½
Foreign	"	.08½@.08¾
Turpentine, spirits bbl., per gal.		.44@.46½
White lead. Am., dry	lb.	.05½@.05¾
American, in oil	"	.06½@.07
Foreign, in oil	"	.10½@.10¾
Zinc white, Am. extra dry	"	.05½@.05½
French, proc's, red seal, dry	"	.06¾@.07
French, process, green seal, dry	"	.07¼@.07½
PHOSPHATES—Acid		.57@60c. per unit
*Fla., hard rock 77%		6.50@7.50
land pebble 68%		3.75@4.00
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@4.00

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal	lb.	$.08½@.09
Powdered or granulated	"	.08½@.08¾
Bichromate, Am.	"	.08¼@.08¾
Scotch	"	.10¼
Bromide	"	.20
Carbonate (80@85%)	"	.03¾@.04
Caustic, ordinary	"	.06½@.06¾
Elect. (90%)	"	.05½@.06
Chloride (muriate), 100 lb.		1.90
Chlorate, powdered	"	.09¼@.09¾
Crystals	"	.09@.09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots		18½c.
Less than 5 tons		.20@.22½
Kainite, long ton, bulk, 8.50; bags, 9.50.		
Permanganate	lb.	.09½@.10½
Pressiate, yellow	"	.13@.13½
Red	"	.30@.33
Sulphate (basis 90%)	100 lb.	2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c.
Imported, non-arsenical, furnace size, per unit		.12@.12½
Imported, arsenical, furnace size, per unit		.11½@.12
Imported fines, arsenical, per unit		.09
Imported fines, non-arsenical, unit		10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.13
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined, crystals	"	5.50@6.00
SILICA—		
Ground quartz, ord'ry.	lg. ton.	10.00@15.00
Silex, ground	"	13.00@15.00
Silex, floated	"	35.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.33½@.36¾
SODIUM—Acetate	lb.	.04½@.05
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb		1.00@1.30c.
Soda, caustic, per 100 lb., 78/60		1.90@2.00
Soda, caustic, powdered		.02¾@.03½
Salt cake, per 100 lb., bulk		.40 up
Salt cake, bbl		.65@.85
Soda, monohydrate, per lb		1.40@1.75
Bichromate	lb.	.06½@.06¾
Bromide	"	.20
Chlorate, com'l	"	.08½@.09½
Cyanide ("100% KCN")		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Hyposulphite, Am.	"	1.30@1.50
German	"	1.60@1.70
Phosphate	100 lb.	2.20@2.50
Prussiate	"	.08½@.09
Sal soda, f.o.b. N. Y.	"	.65@.75
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	"	.65@1.50
Sulphate, com'l (Glauber's salt)	100 lb.	.60@.80
Sulphate, com'l, calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07½@.08
SULPHUR—Louisiana (prime) to New York	lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore	"	22.50 up
Roll	100 lb.	1.85@2.15
Flour	"	2.00@2.40
Flowers, sublimed	"	2.20@2.60
Sicilian, extra qual., unmixed seconds, crude brimstone to New York	lg. ton.	$22.00
Other ports	"	22.50
TERRA ALBA—Fr. & Eng.	100 lb.	.80@1.00
TALC—Domestic	sh. ton.	15.00@20.00
French	"	18.00@25.00
Italian, best	"	30.00@40.00
TIN—Bi-chloride, 50%	lb.	.09
Crystals	"	.20½@.23
Oxide, lb.	"	.32½@.35
URANIUM—Oxide	"	3.50
ZINC—Chloride sol., com. 20°	"	.02½
Chloride, granular	"	.05@.06
Dust	"	.05@.05½
Sulphate	"	.02¼@.02½

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